TEXTILES PAPER LEATHER

AMERICAN DYESTUFF REPORTER

Including the Proceedings of the
AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

VOLUME XIV JUNE 1, 1925 NUMBER 9

GEIGY

A FALL SEASON REMINDER

Geigy contributed originally the Erio Chrome Colors to the dyestuff world, and is continuing their improvement and manufacture.

These excellent all around fast colors reign supreme in the fields of woolen manufacture, vigoureux and calico printing, carpet yarn dyeing and numerous others where the animal fibre is used.

To those uninitiated, Geigy has a shade card for every imaginable use of the Erio Chrome Colors. If you will write, stating the kind of work you are doing, a suitable shade card will be sent gladly.

Address:
Geigy Company, Inc.,
89-91 Barclay St.,
New York City
Attention Publicity Dept.

Selling Agents for
J. R. GEIGY S. A.
Basle, Switzerland

BRANCHES:
Boston Philadelphia
Providence Toronto
Columbus, Ga.

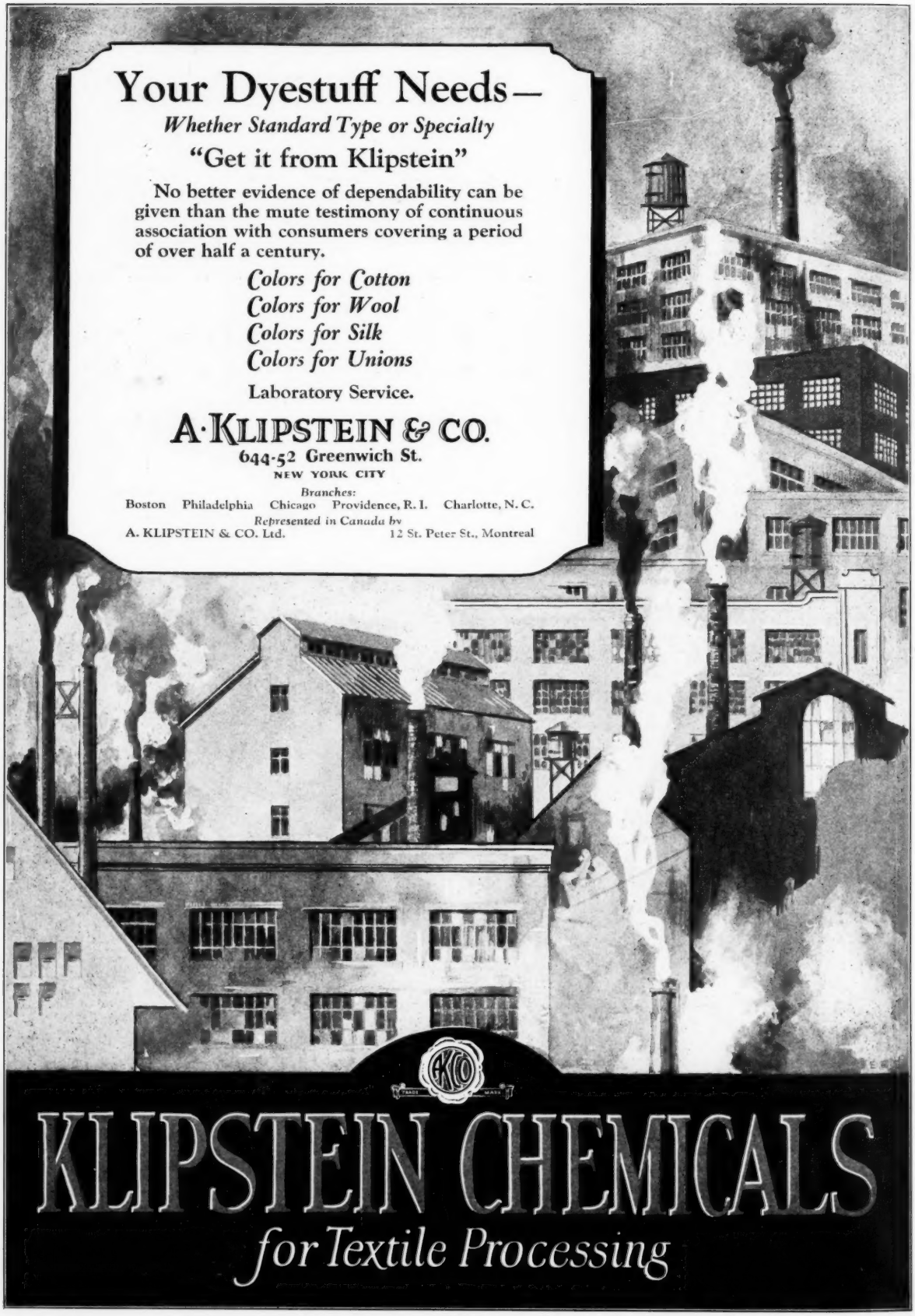
GEIGY COMPANY Inc.
89-91 BARCLAY STREET
NEW YORK, N. Y.

In Great Britain:
THE GEIGY COLOUR CO., LTD
35-37 Dickinson Street
Manchester

Branch Works at Clayton

Established 1764

Manufacturers of dyestuffs since 1859


Your Dyestuff Needs—
Whether Standard Type or Specialty
"Get it from Klipstein"
No better evidence of dependability can be given than the mute testimony of continuous association with consumers covering a period of over half a century.
Colors for Cotton
Colors for Wool
Colors for Silk
Colors for Unions
Laboratory Service.
A·KLIPSTEIN & CO.
644-52 Greenwich St.
NEW YORK CITY
Branches:
Boston Philadelphia Chicago Providence, R. I. Charlotte, N. C.
Represented in Canada by
A. KLIPSTEIN & CO. Ltd. 12 St. Peter St., Montreal
AKCO
KLIPSTEIN CHEMICALS
for Textile Processing

American Dyestuff Reporter, Vol. XIV, No. 9. June 1, 1925. Published twenty-two times a year by Howes Publishing Co., Inc., 90 William Street, New York, N. Y. Domestic subscription $5.00; Canadian, $5.50; foreign, $6.00. Entered as second-class matter Nov. 6, 1919, at the New York, N. Y., Post Office, under the Act of March 3, 1879. Copyrighted, 1925, by Howes Publishing Co.

AMANIL FAST ORANGE G L Z

A valuable product, first time manufactured in America. Our product is superior in solubility to its prototype,

Pyrazol Orange G

It is a bright, yellowish orange of good fastness to light, washing and acids and is especially suitable for the dyeing of silk and cotton mixtures. Discharges perfectly.

Our line of direct dyeing oranges now contains a dye for nearly every requirement, viz:

	Prototype
AMANIL FAST ORANGE 5 G L	Mikado Oranges
AMANIL FAST ORANGE 3 G	Mikado Oranges
AMANIL FAST ORANGE 5 R L	Mikado Oranges
AMANIL TOLUYLENE ORANGE Y	Toluylene Orange Y
AMANIL TOLUYLENE ORANGE R	Toluylene Orange R
AMANIL FAST ORANGE P R Z	Pyrazol Orange R
AMANIL FAST ORANGE G L Z	Pyrazol Orange G
AMANIL ORANGE Y	Benzo Orange R

American Aniline Products, Inc.

45 EAST 17th STREET, NEW YORK, N. Y.

Offices: Boston, Mass.
Philadelphia, Pa.
Chicago, Ill.

Works: Lock Haven, Pa.
Nyack, N. Y.

COMPLETE

Laboratory Service

For Textile Mills

Dyestuffs Tested for
Identity, Fastness, Strength.

Dyestuffs on
Dyed Materials Identified.

THE facilities of our excellently equipped laboratory, and the services of our experienced textile chemists are available to textile mills on the basis of a moderate annual fee covering all routine work, or for special work upon a standard scale of prices.

Our wide experience in dyestuff chemistry, our modern apparatus, and, in particular, our files of type samples of over 3,500 different varieties of dyestuffs, make possible a most superior service.

Complete information will be furnished on request.

TINC TURA
Laboratories, Inc.

85 Fort Greene Place, Brooklyn, N. Y.

Unevenly Dyed
"Three-Fibre Hose"
Streaked Dyeing and
Smears on the Finished Hose

are generally caused by the fact that oils used for winding Artificial Silk are

NOT boiled out properly

"HYDROXY THREE FIBRE BOIL OFF OIL"

boils out these oils and **degums** the pure silk at the same time. The oils are held in suspension, preventing the streaking and the smears.

This should interest anyone making a hose or fabric from Art Silk, Pure Silk and Cotton or Worsted.

Manufactured only by

KALI MANUFACTURING CO.

1410 N. Front Street, Philadelphia, Pa.

Onyx Oil & Chemical Co.

Oils, Chemicals, Gums and Finishes
for the
THROWSTER, DYER, FINISHER AND PRINTER

Headquarters for

SANITOSE
Reg. U. S. Pat. Off.
A superior silk finish

SILTEX GUM
Reg. U. S. Pat. Off.
The new printing gum

DECERESENE
Reg. U. S. Pat. Off.
The chemical degummer

Office and Works: Jersey City, N. J.

Our Laboratory at your service.

HA
M E
T Z
CO
Reg. U. S. Pat. Off.

Indanthrene
Thio-Indigo
Helindon
Hydron

—*and other vat dyes*

Stock and Importations

direct from the manufacturers

A complete line of

Acid, Basic, Chrome, Sulphur and Direct Colors, Intermediates, Cotton Finishes, Turkey Red Oils, Soluble and Leather Oils

Manufactured by

Consolidated Color & Chemical Co.
Central Dyestuff & Chemical Co.
Williamsburg Chemical Co.
and other American manufacturers

H.A.METZ & CO. Inc.

122 Hudson Street, New York, N. Y.

128 Oliver St., Boston, Mass.
301½ West Trade St., Charlotte, N. C.
449 N. La Salle St., Chicago, Ill.
132 Chestnut St., Philadelphia, Pa.
316 Turk's Head Bldg., Providence, R. I.
20 Natoma St., San Francisco, Cal.

HA
M E
T Z
CO
Reg. U. S. Pat. Off.

Long, Economical Service

Live steam, acids and alkalis tend to shorten the life and lower the efficiency of dyeing equipment. But some machines, like some men, seem able to withstand wear and tear better than others.

For instance, in many places through the United States as well as abroad, there are

KLAUDER-WELDON

Dyeing · Bleaching · Scouring

MACHINES

which, **built nearly half a century ago,** are still operating **economically.**

One of our experts will gladly discuss any dyeing difficulty or problem you may have.

Special Construction When Required

KLAUDER-WELDON DYEING MACHINE CO.

Originators · Pioneers · Leaders

BETHAYRES · PENNSYLVANIA

Specialization

TOLHURST CENTER SLUNG EXTRACTOR

Basket Sizes 40, 48 and 60 inches
Direct Motor or Counter Shaft Drive

The TOLHURST "Center Slung" is radically different from the universally known Self-Balancing Extractor, both in design and principle, yet it occupies an important place in the textile industry by meeting certain specific needs.

The height of the "Center Slung" is suited to the average operator, the basket bottom can be reached easily and comfortably and the contents of the basket can be seen at all times.

TOLHURST
REG. U.S. PAT. OFF.
CENTRIFUGAL
EXTRACTORS
TOLHURST MACHINE WORKS ESTABLISHED 1852. TROY, N.Y.

New York Office, 111 Broadway

1816 ISCO CHEMICALS *1925*

"Over a Century of Service and Progress"

BLEACHING POWDER

FINISHING MATERIALS

FORMIC ACID

COLORS

GUMS and WAXES

DYESTUFFS **CAUSTIC SODA**

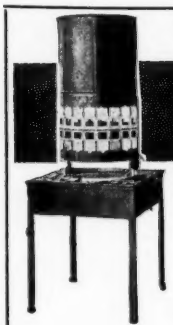
INNIS, SPEIDEN & CO.

Manufacturers, Importers, Exporters of Industrial Chemicals

46 Cliff Street **New York**

BRANCHES:

Chicago **Philadelphia** **Boston** **Cleveland**
Gloversville, N. Y.



Will it Fade? Ask the

FADE-OMETER

Standardized Sunlight

Do You Still Use a Sun-dial?

A sun-dial to-day is a curiosity; yet once it was the only method of telling time. Not so many years ago the sun was the only method of testing for fastness to light. But now you have

The Fade-Ometer

the modern way, the practical way of testing your colors. We would like to send you full details, without obligation.

Atlas Electric Devices Co.

364 W. Superior St. **Chicago, Illinois**

New York
F. Schlayer
25 Howard Street

London
Kelvin Bottomley & Baird, Ltd.
51/52 Fenchurch St., E. C.

Made in America

USE "CAMEL" DYES

—for silk

for fastness to light and washing

FAST SILK BLUE 6 G
FAST SILK BLUE 8 G

Greener, brighter, faster and stronger than Direct Fast Blue 4 G L on silk
Fast to one per cent neutral soap for fifteen minutes at 140° F.
Draws with Glauber salt and soap on silk Dyes silk and artificial silk same shade

Recommended for Washable Shirtings and Dress Goods

WRITE FOR SAMPLES AND PRICES

Manufactured by

JOHN CAMPBELL & COMPANY

75 Hudson Street *American Dyestuff Manufacturers* New York, N. Y.

BRANCHES AND WAREHOUSES

BOSTON CHICAGO PROVIDENCE CHARLOTTE PHILADELPHIA

"STANDARDS EVERYWHERE"

Röhm & Haas Company, Inc.

We have specialized in the manufacture of

Hydrosulfites

and Allied Products

Lykopon—Anhydrous Sodium Hydrosulfite for reducing indigo and vat dyes, for stripping, etc.

Formopon—Sodium Formaldehyde Sulfoxylate for discharge printing.

Indopon W—Indigo Discharge Assistant.

Formopon Extra—Basic Zinc Formaldehyde Sulfoxylate for stripping dyes.

Protolin—Soluble normal Zinc Formaldehyde Sulfoxylate for stripping dyes.

Protolin AZ—A special soluble Sulfoxylate for stripping dyes.

Our laboratory makes a special study of these products and their application, and appreciates the opportunity of co-operating with users in solving any problems which the employment of these products presents. Suggestions for stripping dyes from all classes of goods are supplied on request.

We also manufacture in our own plants a wide range of Heavy Chemicals, including Acids, Sodium Sulfide, Glauber's Salt, Aluminum Sulfate, Aluminum Chloride, liquid and crystals, Tartar Emetic, etc.

Office
40 North Front Street
PHILADELPHIA

Factories
Bristol and Bridesburg, Penna.
Branches
Chicago, Ill. Gloversville, N.Y.
Boston, Mass.

Service and Economy

WHAT YOU CAN DO
WITH
SUPERIOR COLORS

Everyone knows that without the right materials no dyer can produce the desired results

ALIZARINES
BEAVER
SULPHUR COLORS

With our famous Alizarine Sulphur Colors a dyer can attain to the very greatest success.

DUNKER & PERKINS CO.
New England Agents
263 SUMMER ST., BOSTON

Established 1895

BOSSON & LANE

Manufacturers of
The Original
BLEACHING OIL
for boiling out Cotton, to produce a foundation for a Pure White

High Grade Sulphonated and Saponified
CASTOR OIL PRODUCTS

Para Soap Oil

Solvents and Assistants for cleaning all Textiles

B & L Bleachers' Bluings and Tints

Works and Office, ATLANTIC, MASS.

Grasselli Dyestuff Corporation

Plants:
Rensselaer, N. Y.
Grasselli, N. J.

Sole importers of colors manufactured by the

Farbenfabriken vorm. Friedr. Bayer & Co. Leverkusen

117 Hudson Street, New York

Boston Providence Philadelphia
Chicago Charlotte San Francisco

Represented in Canada by
Grasselli Dyestuff Corporation, Ltd.
Toronto

Sole Selling Agents:
Essex Aniline Works

DIAX

Bleachers, Finishers and Dyers have complained that de-sizing compounds were expensive and hard to handle.

DIAX, made by the MALT-DIA-STASE CO., brought down the price and made its use easy.

DIAX, because it is better, is being used with great success by the largest Bleachers, Finishers, Printers and Dyers

Write us for Free Demonstration and Sample

MALT-DIASTASE COMPANY
79 Wall St., New York City

LABORATORIES
58-64 Garden Street, Brooklyn, N. Y.
Wyckoff Avenue and Decatur Street, Evergreen, N. Y.

DYES

for

"Celanese" Brand Yarns, Fabrics, Etc.

"CR" (Celanese Resist) Cotton Colors

Dye Cotton and Artificial Silk

LEAVE CELANESE WHITE

"SRA" Colors

DYE CELANESE

Leave Cotton and Artificial Silk White

By use of "CR" and "SRA" dyestuffs any TWO COLORS can be obtained in ONE BATH on "Celanese" and Cotton or "Celanese" and Artificial Silk.

"CR" and "SRA" dyestuffs are made specifically for use with "Celanese" and are prepared and tested under expert supervision.

To meet the public demand for colors FAST to LIGHT and WASHINNG we offer "SRA" for DYEING CELANESE. Economical to use, they assure moderate cost in dyeing.

SAMPLES SENT ON APPLICATION

Authorized Distributors

AMERICAN-BRITISH CHEMICAL SUPPLIES, Inc.

Room 1505, 15 East 26th Street, New York City

Telephone, Madison Square 3312

"Celanese" is the registered trade-mark of the American Cellulose & Chemical Manufacturing Co., Ltd., 15 East 26th Street, New York, N. Y., for its yarns and fabrics, etc.

ALTHOUSE AZANOL SCARLET

Unsurpassed for Discharge Printing

This is but one of a distinctive group of Colors having specialized qualities which commend our products to the progressive dyer.

Azanol Scarlet has the most satisfying level dyeing properties, apparent in the treatment of all fabrics. It may be dyed either as an acid or a chrome color, is unusually well suited to Unions, and altogether fast to mineral acids when applied to cotton.

Ask for a Sample

Althouse Chemical Company

READING, PA.

Pioneers—

BRETON MINEROL E

prevents

STATIC

The consensus of mill opinion after nearly two years' practical experience is that the Breton Minerol E process

DOES:

Produce a yarn with unusual elasticity.
Lessens fire hazard.

BORNE, SCRYMSER COMPANY

Established 1874

17 Battery Place, N. Y.

Works: Bayway, Elizabeth, N. J.

HYDROSULFITE

AN improved process in the manufacture of Hydrosulfite enables us to offer a uniform product, completely soluble, that will not precipitate inactive metallic matter in the stripping bath.

May we submit sample and price?

ARKANSAS CO., Inc.

233 BROADWAY
NEW YORK CITY

Starch

Dyeing and Finishing Processes offer special problems in the use of

STARCHES DEXTRINES and GUMS

The selection of proper products is of great importance.

THIN BOILING STARCHES

having a wide range of fluidity,

DEXTRINES and GUMS

covering a wide range of color and solubility are available.

We offer our services in making proper selection and assisting in correct application.

CORN PRODUCTS REFINING CO.
17 Battery Place, New York

BOSTON PHILADELPHIA GREENVILLE, S. C.

Starch

Contents of This Issue

June 1, 1925

Chemical Constitution and Fastness of a Dyestuft 347
Dr. Fritz Mayer

Dyeing Acetate Silk—Part VI..... 350
Charles E. Mullin

Proceedings of the American Association of Textile Chemists and Colorists.

April Meeting of the Southern Section... 353

Address of Welcome..... 353
Dr. M. L. Brittain

The Manufacture and Use of Artificial Silk 355
H. W. Rose

The Dyeing of Artificial Silk (*A Paper*) 358
E. F. James

Discussion of Above Papers..... 364

Twenty-eighth Research Committee Meeting 366

Twenty-ninth Research Committee Meeting 366

Thirtieth Council Meeting..... 366

Thirty-first Council Meeting..... 367

Applicants for Membership..... 368

Changes of Address..... 368

Editorials:

With Emphasis on the Good Spots..... 369

Checking Up Careless Mailing..... 369

Highs and Lows in a Busy Chemist's Life—Part IV 370

Recent Literature:

Popular Textile Chemistry..... 371

Artificial Silk 371

Technology of Cotton Machinery..... 371

Dyestuff Tables 372

Practical Hints on the Production of Bright Colors on Textile Fabrics—Part XIII.. 374

Technical Notes from Foreign Sources..... 377

Old Sol Is Smiling

because he has cunningly
hid his powers in
Solozone, through which
for 15 years
he has produced his own
harmless bleaching effect
on Cotton, Wool, Silk

THE -Ask us-
ROESSLER & HASSLACHER CHEMICAL CO.
709 Sixth Ave. New York

ALBINOL
the Supreme
TEXTILE SOAP

Aniline Colors Dyestuffs

Chemicals and
Chemical Specialties

Softeners and Soluble Oils

EUGENE VELLNER
1209-11-13 North 4th St., Philadelphia, Pa.

Dyes for All Wool and Mixed Fabrics—

Designers are at work on the middle and heavy weight fabrics for next season's wear. For all wool fabrics, National Top-chrome and National Meta-chrome dyes occupy a prominent place in the modern dyehouse, ensuring fast shades suitable for this class of fabrics.

Mixed dress materials call for suitable combinations of Direct and Acid Dyes, selections of which may be made from the National Shade Cards.

National Aniline & Chemical Company, Inc.
40 Rector Street, New York, N. Y.

Boston	Philadelphia	San Francisco
Providence	Chicago	Toronto
Hartford	Charlotte	Montreal

NATIONAL DYES
FOR TEXTILES

NATIONAL N DYES

AMERICAN DYESTUFF REPORTER

"Circulated Everywhere Dyestuffs Are Used"

Devoted to the practical application of dyestuffs in all industries; especially to textile chemistry—the science and practice of scouring, bleaching, dyeing and finishing.

VOLUME XIV NEW YORK, JUNE 1, 1925 NUMBER 9

Chemical Constitution and Fastness of a Dyestuff

Fastness Defined—Resistance of the Coloring Matters to Various Reagents—Fastness of the Sulphur Dyestuffs

By DR. FRITZ MAYER

Textilberichte, 1924, *page* 801

(Translated by Ismar Ginsberg, B. Sc., Chem. Eng.)

THE chemist who is concerned with the development of new dyestuffs must be able to prove that his new product is able to meet two additional requirements besides possessing the proper color tone. His dyestuff must be capable of production at a reasonable figure, and furthermore it must also possess the proper degree of fastness. While the price of the dyestuff can be taken into consideration in the course of the researches carried out in its development, as, for example, by the selection of the least costly materials to work with and of the most efficient methods, the fastness of the dye cannot be based in any satisfactory manner on such a theoretical ground.

Then, again, while it has been possible to assign certain fastness characteristics to groups of dyestuffs, as, for example, in calling the triphenylmethane dyestuffs not fast to light, noting the great fastness to washing of the simple substantive coloring matters, the lack of fastness to rubbing of many members of the vat dyestuffs, nevertheless there are often found cases among the members of a series of coloring matters which possess a greater or lesser degree of fastness than that by which the class is generally denoted. And this is found in dyestuffs which do not seem to show any marked difference in structures from the typical dyes of the class.

A great many experiments have been carried out to determine the relation that exists between the fastness of a coloring matter and its chemical constitution. A particularly intensive experimentation has been carried out in the attempt to solve the difficult problem of the relation between fastness to light and the constitution of a coloring matter. It must be stated at the outset that the fastness of a coloring matter on the fiber must not be considered as being the same in every case as the fastness of the dyestuff itself. As far as the resistance of the coloring matter on the substratum—that is, the fiber—is concerned, the principal factor is the influence of the substratum and the method of dyeing; and in many cases, as, for example, regarding the fastness of the coloring matter to light, the influence of the surrounding atmosphere must also be taken into consideration. This has the effect of complicating the matter and making it difficult to distinguish between the various factors which play a part in the phenomena.

The Definition of Fastness

It is possible to define fastness in clear terms, as the resistance of the coloring matter on the textile fiber or on the substratum, toward certain influences met with in its use. Before it is possible to consider the relation between the constitution of the coloring matter and its fastness, a few words must be said on the influence of the fiber or the substratum itself. It appears evident at the outset that the degree of fineness in which the dyestuff is found on the fiber or the substratum must have a great influence on its fastness. It is also clear that the first signs of decomposition of the dyestuff will be observed much later in the case of deep, strongly colored fabrics than on those which are but slightly colored with the dyestuff.

Chemical transformations of the coloring matter are often controlled by the fineness of sub-division of the latter. This applies to all substances as well, and it often happens that chemical reactions are brought about by the addition of other substances or by stirring or shaking which tends to increase the fineness of the distribution of the reacting substances. Accordingly the difference in the degree of fineness of particles of the dyestuffs appears to be a cause of the variation in the degree of fastness exhibited by the dyes on various fibers. One

fact seems to indicate the truth of this theory and that is that, when the coloring matter is permitted to fix itself slowly to the fiber, a color is obtained which is more fast to rubbing than when the color is directly or immediately precipitated on the fibers. This fact is particularly well demonstrated in the fastness of rubbing of vat dyestuffs —Indigo. This is the reason why deep shades of this coloring matter are obtained to better advantage by dyeing in a large number rather than in a small number of dye baths.

It is true that many investigators have busied themselves with this problem from the standpoint of the physical form of the dyestuff on the textile fiber, but the results that have been obtained are quite unsatisfactory. There seems to be contradictory factors that control this relationship, and it may be mentioned here as an example that it is often found that dyestuffs are faster on wool and silk than on the plant fibers. This seems to be due to the manner in which the coloring matters are held on the fiber. In spite of this fact, it appears probable that the explanation does not lie in the assumption that this is brought about by the existence of amino acids as fixing agents in the animal fibers.

On the other hand, it is to be hoped that the experiments and investigations that have been undertaken to determine the real constitution of cellulose will afford information which will be better able to explain the coloring process on plant fibers. Then, if attention is turned to the question whether or not the animal and vegetable fibers are able to exert reduction and oxidation actions on the coloring matters, certain individual instances will be recognized in this connection, as, for example, fastness to bucking and steaming. Then again, it must be brought to mind that all fibers contain foreign materials, with which they come in contact during the finishing processes and which they can retain in certain proportions, when these processes are not properly carried out. These foreign substances must have some action on the dyestuffs in the dyeing process. This clearly indicates the great variety of factors that must be taken into consideration in studying the fastness of coloring matters.

Resistance of the Coloring Matters to Various Reagents

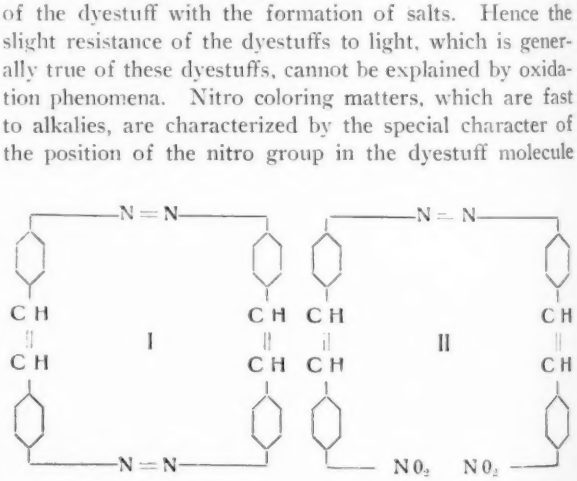
If the resistance of coloring matters toward various reagents is studied, from the standpoint of these reagents themselves, then the following thoughts will be of interest. Fastness to rubbing depends undoubtedly on the manner in which the dyestuff clings to the textile fiber. The same thing is true of fastness to ironing, or heat resistance, but in this case the decomposition of the dyestuff by heat must also be taken into consideration. Fastness to washing is also allied with the relation that exists between the coloring matter and the fiber on which it is fixed.

(The author at this point goes on to explain the importance of the action of acids in testing the fibers for fastness to carbonization, to sulphur, to acids, to acid and cooking, to acetic acid in testing for fastness to sweating. He also discusses the action of alkalies in testing for fastness to washing, to soda, to fulling, to bucking, etc. He says that the most difficult problem is the determination of the fastness of dyestuffs to light, which is after all a most important, if not the most important, property of a great many dyestuffs.—Trans.).

Oxygen, moisture and the character of the light rays play the most important roles in the light resistance phenomenon. The nature of the reactions that take place under these conditions has often been explained as both oxidizing and reducing. It seems possible that the light resistance of a coloring matter can be improved by incorporating certain retarding catalysts with the fibers without changing the character of the material and leaving the dyestuffs on the fiber in its original condition. This is a problem that has not yet been satisfactorily solved. It is therefore evident why the mordant dyestuffs seem to possess in most instances greater fastness to light, for by the use of mordants the entire color and fiber system becomes stronger.

When an examination is made of a number of coloring matters from the standpoint of fastness in relation to the classes into which they are divided, it is possible to make the following observations which are of interest.

In case of the nitro coloring matters it is understandable that the action of alkalies is to change the nitro group, NO_2, into $\begin{matrix} N = N. \\ \| \\ O \end{matrix}$ This then means that the tone of the coloring matter is changed to a brownish effect, which is expected. On the other hand, it may be assumed that the change may take place to give the aci-form of the dyestuff with the formation of salts. Hence the slight resistance of the dyestuffs to light, which is generally true of these dyestuffs, cannot be explained by oxidation phenomena. Nitro coloring matters, which are fast to alkalies, are characterized by the special character of the position of the nitro group in the dyestuff molecule



with respect to the other groups which also possess the capacity of entering into reactions. Thus, for example, the stilbene dyestuffs, as long as they possess the constitution shown as I, the closed form, are very fast indeed, but when they possess the constitution shown graphically in II, they are not so fast. The latter molecular configuration is evidently open to attack by reagents.

In the case of azo-coloring matters it may be said that the group $N = N$ may be oxidized to the group $\begin{matrix} N \\ \| \\ O \end{matrix} = N.$ This may be brought about by the action of light and results in a shifting of the color tone to the brown side. Then again, the substitutions brought about in this manner exert a very strong influence. Hydroxyl groups cause a much greater weakening of the molecular force that holds together the aromatic group than does the amino group. The sulphonic acid group or the sulpho group makes the dyestuff, when used on wool, fast to washing. In this case the fixation of the dyestuff on the fiber is affected by the acidity of the dyestuffs, and the question arises whether or not a chemical combination took place. On the other hand, these coloring matters are much more easily removed from cotton fabrics. Then again, the nitro group may open up the way to reduction phenomena which will change the $N = N$ group into the $NH - NH$ group.

As the size of the molecule increases, as in the case of the di-, tri- and poly-azo dyestuffs, it is natural to find, as in all reactions, that the reactivity of the molecule or its tendency to be decomposed is decreased due to the fact that the molecule is rendered more difficultly soluble. The same thing holds good of the chemical transformations carried out on the textile fiber itself, as, for example, in developing the dyestuff on the fiber or in the use of the diazo coloring matters. Acids will then have an effect on the coloring matter when the formation of salts or the freeing of color acids bring about a change in the color tone. This phenomenon is strongly emphasized in the case of the azo colors. In this connection, therefore, the method of dyeing and the nature of the substratum are of definite action on the fastness of the product.

Furthermore, when considering the triphenylmethane dyestuffs, it appears likely that the slight fastness of the coloring matters is due to the transformation of the quinoid form into the more stable benzoid or carbinol form. In this connection a very good insight into the entire matter of fastness of coloring matters and chemical constitution is given by the special case of Patent Blue. It is apparent that in this coloring matter the change, referred to above, takes place with greater difficulty. At least this is what seems to have been established by the work that Sandmyer did on this particular subject. Then, again, the low resistance to light of the eosine dyestuffs may be explained in the same manner. And in this case, moreover, the hydroxyl groups present in the molecule of the dyestuff offer points of advantage to attack by alkalies.

In the case of the acridine coloring matters transformations can take place from the quinoid to the benzoid condition, with the result, however, that the entire system becomes more stable and therefore the fastness of the new substance is increased. But on the other hand an explanation is lacking as to why the sensitive coloring matters that belong to the quinolin series are so non-resistant to light, etc., while quinolin yellow possesses good qualities from this standpoint. Furthermore the greatest number of the quinonimim coloring matters can be classed in accordance with their fastness properties with respect to their chemical constitution. So long as they possess the chain form, indophenols, they possess absolutely no practical application, for they are then very reactive compounds from a chemical standpoint. However, this characterization does not apply to the case of the azine, oxazine and thiazine dyestuffs, but here again it is found that the effect of acids with the formation of various acid salts of varying color tones must be taken into consideration. Thus, in this case, Safranine is formed.

Fastness of the Sulphur Dyestuffs

The sulphur dyestuffs owe their fastness to the large size of the molecule and to the lack of substituted products which are attacked by light and other color destroying agencies. These coloring matters are non-fast only to chlorine. The observation that was made by Gnehm in this connection runs parallel with this one, to the effect that Immedial Blue is easily split up to give a simple thiazin by the action of bromine. It is also well known that certain of the sulphur dyestuffs possess the property of affecting the capacity of the textile fabric upon storage. In this respect it is assumed that the reduction of the strength of the fabrics on which these coloring matters are employed is caused by the formation of sulphuric acid from the free sulphur or the sulpho groups that exist in the molecule of the sulphur dyestuffs. No alkali is present to react with this acid and neutralize it. In the case of the anthraquinone coloring matters the fastness of the oxyanthraquinone dyes in the form of metallic lakes is made possible by the conditions which apply to this phenomenon and which are quite similar to those that determine the formation of complex compounds. On the other hand, it is seen in the case of the acid wool colors that the oxy groups in the molecule are weak points therein and lay the dyestuff open to decomposition and destruction, as in all the other classes of coloring matters.

The class of dyestuffs which is known as the anthraquinone vat coloring matters and which may be considered in conjunction with the indigoid dyes in this connection are characterized by a series of special conditions. In accordance with the author's viewpoint, the dyeings obtained with these coloring matters perhaps differ fundamentally from those that have been discussed above. This difference lies in the fact the coloring process leads to another sort of fixation of the coloring matter on the textile fiber. This is quite different from the ordinary fixation of the dyestuff from an aqueous solution which is common to all the other classes of coloring matters.

In the course of the oxidation of the leuco compound of the dyestuff by means of the oxygen in the atmosphere, there result adsorption compounds between the coloring matter and the textile fiber. The degree of fixation of these colors on the fibers depends on the character of the adsorption compound formed in this manner. This is no

longer a matter in which a simple relation exists between the fastness of the dyestuff and its chemical composition.

It was shown by Jljinski, quite some time ago, that when the reduction process was also avoided, the vat dyestuffs are capable of being used again in the dyeing process. However, this observation has not been translated into any practical application, and as far as is known no use is made of this fact in any of the modern dyeing processes. However, the fact that the chemical properties of the coloring matters are of particular importance in this connection has remained undisputed. Then, again, as far as the size of the molecule is concerned, the properties of the dyestuff classes have been very much suppressed; that is, their colors are much subdued, as, for example, in the ketone groups in the case of Indigo, which fact must have a very good influence on the fastness of the coloring matter. The dangerous action of the halogens can be prevented in good shape by repeated halogenation of the large molecule of the dyestuff.

In general, the unsaturated character of the coloring matter is strongly hidden as has been shown by the newer representations of the structural formula for the dyestuff Indigo, which may also be used for other members of the indigoid series. As far as fastness to light is concerned, it appears that the fiber itself on which the dyestuff is used plays a very important role. This can be seen, for example, in the case of Flavanthrene. Another interesting example is the action of light rays on Helindon Scarlet S, Thioindigo with SC_2H_5 groups absorb oxygen, and after a certain length of time, due to the formation of a sulphonic acid, the fibers themselves are destroyed. Then, again, when the vat dyestuffs are used in various admixtures, the probable relationship between the composition of the coloring matter and its fastness cannot be foretold at all. It is impossible to go any deeper into this subject at this point.

While the clearest results seem to be obtained from the examination of the vat coloring matters, it may be said without fear of contradiction that there is no definite and universal rule that relates dye composition and fastness. Certainly investigation is required on this most interesting problem.

Dyeing Acetate Silk

Part VI

(*Continued from page 345*)

Sulphur Dyes on Acetate Silk—Vat Dyes on Acetate Silk—Formulas and Methods Employed for Celanese and Lustron—Indophenol Dyes on Acetate Silk

By CHAS. E. MULLIN, M. Sc., F. A. I. C.

(*All rights reserved by author.*)

A FEW sulphur dyes are applicable to acetate silk if applied in a hydrosulphite vat in the same manner as the ordinary vat dyes on cotton, but giving particular attention to the alkalinity and temperature of the dye bath so as to avoid saponification of the acetate silk. They may also be applied by the saponification process, which will be discussed later. Clavel obtained British Patent No. 191,553, November 19, 1921, on a process for applying full shades to acetate silk with either sulphur or vat dyes. According to this patent the dye should be reduced by hydrosulphite in a bath freely alkaline by ammonia and containing only sufficient caustic alkali to combine with the leuco-base of the dyestuff, but not enough to hydrolyze the acetate silk. When exhaustion of the dye bath is effected by the addition of salts, such as the chlorides of calcium, barium and magnesium, precipitation is prevented by the addition of protective colloids, such as gelatin, silk boil-off liquor, glucose, starch, etc.

British Patent No. 214,330, recently issued to the Clayton Aniline Company, covers the use of sodium lignin sulphonate, resinous matter and various sugars, in the form of waste liquor from the manufacture of sulphite paper pulp. They claim that this waste liquor exerts a protective action on the acetate silk in the presence of strong caustic alkalies and recommend its use in the application of sulphur dyes to the cotton of acetate silk—cotton unions. As the acetate silk is not saponified it remains unstained by the sulphur dye.

Method No. 42: Sulphur Dyes on Acetate Silk-Cotton Unions.—Many sulphur dyes, even blacks, can be applied to acetate silk-cotton unions, leaving the acetate silk clean, if applied at low temperature in short baths containing as little sodium sulphide and alkali as possible to hold the dye in solution. The following has been recommended for Lustron:

For 100 pounds of dye bath use 1 pound Sulphogene Carbon H Black, 2 to 2.25 pounds of sodium sulphide crystals, 0.25 pound soda ash and 0.25 to 0.5 pound salt. Dye at a temperature of not over 24 deg. Cent. (75 deg. Fahr.), and 20 deg. Cent. (68 deg. Fahr.) is decidedly better for the acetate silk. A full shade is obtained in one to one and one-quarter hours.

Vat Dyes on Acetate Silk

On account of its resistance to alkalies and tempera ture, Lustron is possibly particularly adapted for appli-

cation of many vat dyes by the usual or slightly modified methods; however, some very nice results have been attained on Celanese. Indigo and certain other vat dyes, especially those of the Indigoid class, such as Ciba, Helindone, Brilliant Indigo, Thioindigo and Durindone brands should be applicable, under the proper conditions as regards alkalinity and temperature. The statement has been made that the vat dyes do not follow the same fastness laws on acetate silk as they do on cotton, and that the latter dyes developed especially for acetate silk have an even greater fastness on it than the vat dyes. Davies states that very careful adjustment of alkali and hydrosulphite is necessary and that the dyeings show a tendency to crock.

In using vat dyes the new form known as "grains" should be particularly useful, the "vat" and "paste" forms following in the order named. If vat dye in powder form is used, it should be thoroughly ground with glycerol, pyridin, neomerpin or a similar agent to assist in wetting out and reducing the dye, before adding the alkali or hydrosulphite.

The Lustron Company states that some vat dyes may be applied to Lustron, but that the Indanthrene vats usually give only pale shades. The alkalinity of the bath should be kept as low as possible, and by gradually raising the temperature to a moderate degree, full vat shades can be put on Lustron with some vat dyes. Level shades are obtained only by working the goods well while dyeing. This treatment somewhat impairs the water resistance of Lustron, possibly owing to a partial saponification, but they state that it will still be twice as strong as the other artificial silks when wet. Briggs states that vat dyes, including the Indigoid and those of the Algol and Indanthrene class, which can be used without caustic soda, are suitable for dyeing unsaponified acetate silk, saponification during dyeing being inhibited by the presence of an ammonium salt.

Method No. 43: Ciba Vat Dyes on Celanese.—The Ciba vat dyes have been applied to Celanese with very nice results, and the same results can no doubt be obtained on Lustron. The following method is recommended for their application: The dye vat is prepared by adding about 3 ounces of 30 per cent ammonia, 1 ounce of concentrated hydrosulphite powder and 6 ounces of fish glue, previously dissolved in water, to each 200 gallons of bath at 71 deg. Cent. (160 deg. Fahr.). The dye solution from the stock vat is then added to the dye vat through a fine sieve or cloth. Reference to the article on "The Application of Vat Dyes to Wool," AMERICAN DYESTUFF REPORTER, volume 13, pages 809-15 (1924), will supply many details that may be useful in this connection.

The stock vat is prepared by working 1 pound of the Ciba vat dye in powder form or an equivalent amount of the paste, into a smooth paste with 1.5 pints of 66 deg. Tw. caustic soda solution and 3 ounces Monopole soap. (Note—To dyestuffs in paste form, except Ciba Orange G paste, the addition of Monopole soap can be omitted.) This is mixed with 20 gallons of hot water and while stirring well, 1 pound 3 ounces of concentrated hydrosulphite powder is added gradually and the whole allowed to stand about one-half hour. Table III gives the equivalent weights of the dyes in powder and paste forms, the proper temperature of the stock vat and the color of the vat when properly reduced.

The scoured goods, if dry, are wet out in a bath containing 25 ounces of olive oil soap and 25 ounces ammonia per 100 gallons of liquor at 55 to 60 deg. Cent. (130 to 140 deg. Fahr.) for one-half hour and then entered into the completed dye vat and dyed at 65-71 deg. Cent. (150 to 160 deg. Fahr.) for an hour, with the addition of 2 to 5 ounces of salt per gallon of liquor. After dyeing, the material is hydroextracted and allowed to oxidize in the air for 2 to 3 hours. It is then rinsed and soaped in a bath containing 50 ounces of olive oil soap per 100 gallons at 71 deg. (160 deg. Fahr.) for one-half hour. With Ciba Violet or mixtures containing it, after oxidation in the air, the goods should receive an additional treatment for one-half hour at 71 deg. Cent. (160 deg. Fahr.) with a bath containing 2 per cent dichromate and 2 per cent of 40 per cent acetic acid, on the weight of the goods. It is then rinsed again and soaped as above. The following formulas will give an idea as to the dyes and amounts used to obtain the various shades on Celanese.

TABLE III

Temperature of the Stock Vat and Concentration of Dyestuff in Paste and Powder Forms

Ciba Yellow G (100 parts paste, 10 parts powder)—Temperature of stock vat, 140 deg. Fahr.; color of reduced vat, dull reddish violet.

Ciba Orange G (100 paste, 13.5 powder)—122 to 140 deg. Fahr.; dull brownish olive.

Ciba Brown R (100 paste, 12.5 powder)—140 deg. Fahr.; brownish yellow.

Ciba Scarlet G Extra (100 paste, 20 powder)—104 deg. Fahr.; bluish violet.

Ciba Red R (100 paste, 10 powder)—104 deg. Fahr.; bluish yellow.

Ciba Red G (100 paste, 10 powder)—158 deg. Fahr.; reddish yellow.

Ciba Pink G (100 paste, 10 powder)—104 to 122 deg. Fahr.; dull yellowish brown.

Ciba Pink B (100 paste, 20 powder)—140 deg .Fahr.; reddish yellow.

Ciba Pink BG (100 paste, 10 powder)—140 deg. Fahr.; greenish yellow.

Ciba Violet B (100 paste, 10 powder)—158 deg. Fahr.; dull golden yellow.

Ciba Violet 3B (100 paste, 10 powder)—158 deg. Fahr.; golden yellow.

Ciba Blue 2B (100 paste, 16 powder)—158 deg. Fahr.; golden yellow.

Ciba Blue 2G (100 paste, 16 powder)—158 deg. Fahr.; yellowish olive.

Ciba Green 2G (100 paste, 10 powder)—158 deg. Fahr.; reddish orange.

Indigo Ciba R (100 paste, 20 powder)—122 deg. Fahr.; golden yellow.

Bambino—0.07 per cent Ciba Blue 2G Powder.

Cherub—0.2 per cent Ciba Scarlet G Extra Powder and 0.8 per cent Ciba Yellow G Paste.

Gray—0.23 per cent Ciba Blue 2B Powder, 1.5 per cent Ciba Orange G Paste and 0.04 per cent Ciba Red G Powder.
Hollyhock—3.2 per cent Ciba Pink B Powder and 0.25 per cent Ciba Violet B Powder.
Canary—3 per cent Ciba Yellow G Paste.
Rangoon—48 per cent Ciba Orange G Paste, 1 per cent Ciba Red G Powder and 2 per cent Ciba Indigo R Paste 20 Per Cent.
Pink—0.07 per cent Ciba Pink G Powder.
Pigeon—1.2 per cent Ciba Blue 2B Powder, 6 per cent Ciba Orange G Paste and 0.5 per cent Ciba Red G Powder.
Bonfire—8 per cent Ciba Red G Powder.
Taffy—3 per cent Ciba Orange G Paste, 0.03 per cent Ciba Red G Powder and 0.02 per cent Ciba Blue 2B Powder.
Celestial—0.5 per cent Ciba Blue 2G Powder.
Putty—0.25 per cent Ciba Blue 2B Powder, 4.5 per cent Ciba Orange G Paste and 0.13 per cent Ciba Red G Powder.
Tangerine—32 per cent Ciba Orange G Paste and 8 per cent Ciba Pink BG Paste.
Mignonette—0.45 per cent Ciba Blue 2B Powder, 4 per cent Ciba Orange G Paste and 0.03 per cent Ciba Red G Powder.
Taupe—0.6 per cent Ciba Blue 2B Powder, 4.5 per cent Ciba Orange G Paste and 0.25 per cent Ciba Red G Powder.
Brickdust—8 per cent Ciba Brown R Paste, 2 per cent Ciba Red G Powder and 16 per cent Ciba Orange G Paste.
Amethyst—0.9 per cent Ciba Violet 3B Powder and 0.1 per cent Ciba Blue 2B Powder.
Congo—5.5 per cent Ciba Indigo R Paste 20 Per Cent, 32 per cent Ciba Orange G Paste and 1.2 per cent Ciba Red G Powder.
Maple Sugar—0.12 per cent Ciba Blue 2B Powder, 2.5 per cent Ciba Orange G Paste and 0.1 per cent Ciba Red G Powder.
Cream—0.2 per cent Ciba Orange G Paste and 0.15 per cent Ciba Yellow G Paste.
Spice—30 per cent Ciba Orange G Paste, 10 per cent Ciba Brown R Paste and 5 per cent Ciba Yellow G Paste.
Electric—1.2 per cent Ciba Blue 2B Powder, 1.6 per cent Ciba Orange G Paste and 1.6 per cent Ciba Yellow G Paste.
Pearl—0.20 per cent Ciba Blue 2B Powder, 1.30 per cent Ciba Orange G Paste and 0.08 per cent Ciba Red G Powder.
Meadowlark—0.7 per cent Ciba Blue 2B Powder, 9 per cent Ciba Orange G Paste and 0.3 per cent Ciba Red G Powder.
Golden Glow—12 per cent Ciba Yellow G Paste and 8 per cent Ciba Orange G Paste.
Apple Blossom—1 per cent Ciba Red G Powder, 0.12 per cent Ciba Violet B Powder and 0.6 per cent Ciba Orange G Paste.
Fudge—2.8 per cent Ciba Indigo R Paste 20 Per Cent, 35 per cent Ciba Orange G Paste and 1.2 per cent Ciba Red G Powder.
Vervain—0.14 per cent Ciba Violet 3B Powder.
Asphalt—0.65 per cent Ciba Blue 2B Powder, 7.5 per cent Ciba Orange G Paste and 0.16 per cent Ciba Red G Powder.
Champagne—0.9 per cent Ciba Orange G Paste and 0.01 per cent Ciba Red G Powder.
Lead—0.9 per cent Ciba Blue 2B Powder, 5 per cent Ciba Orange G Paste and 0.22 per cent Ciba Red G Powder.
Columbia—2 per cent Ciba Blue 2G Powder.
Chutney—2.5 per cent Ciba Indigo R Paste 20 Per Cent, 36 per cent Ciba Orange G Paste and 2 per cent Ciba Red G Powder.
Lotus—0.5 per cent Ciba Red G Powder and 0.2 per cent Ciba Pink BG Powder.
Chinese Green—38 per cent Ciba Green G Paste and 10 per cent Ciba Yellow G Paste.
Banner—8 per cent Ciba Blue 2B Powder.

No doubt many of the Helindone vat dyes can be supplied by Method No. 43, using formulas along the line of those given for Helindone dyes on wool in the article mentioned above. Durindone Red Y, Ciba Blue and Indigo Blue paste have also been mentioned in the literature as applicable to acetate silk.

Indophenol Dyes on Acetate Silk

The Indophenols are more or less obsolete as dyes on the older fibers, but may be useful on acetate silk. These dyes belong to the naphthoquinonemonoimide series. Certain Indophenols have, according to British Patent No. 220,505 (1923) to the British Celanese Company, a very good direct affinity for acetate silk, giving blue and violet shades not directly obtainable with azo dyes. In British Patent No. 219,349, which will be discussed later, it was proposed to apply the Indophenols from an aqueous dispersion, but the present patent covers their application from the usual alkaline hydrosulphite vat. In this manner the leuco-dye is readily absorbed by the acetate silk and upon oxidation, either in the air or by means of hypochlorites, peroxides or other oxidizing agents, colors which are usually fast to soaping and light are obtained.

Method No. 44: In this manner a deep royal blue may be obtained on 100 kilos of acetate silk by dissolving 1 k. of caustic soda and 1 k. of dimethyl-p-aminophenyl-1:4-naphthoquinonemonoimide in 100 liters of water at 60 deg. Cent. (140 deg. Fahr.). This is reduced with 2 k. of sodium-hydrosulphite and when reduction is complete, filtered into the 30 to 1 dye bath at 50 deg. Cent. (122 deg. Fahr.) already containing 0.5 gram of sodium hydrosulphite and 2 c.c. of concentrated ammonia per liter. The material is worked for about an hour and a half, adding alkali or hydrosulphite as required to hold the dye in solution, after which the material is rinsed and finally oxidized in a bath containing 2 g. per liter of sodium perborate at 40 deg. Cent. (104 deg. Fahr.) for thirty minutes.

Method No. 45: *A Dispersol Method of Applying Indophenols.*—Another method is to very finely grind 500 grams of the above naphthoquinone with 10 liters of water and add this to a 2,000 liter dye bath containing 4 k. of previously dissolved glue. The material is entered at 40 to 50 deg. Cent. (104 to 122 deg. Fahr.) and while working the temperature is raised to 60 to 70 deg. (140 to 158 deg. Fahr.) until the desired shade is obtained. This latter process should really come under the dispersion method of dyeing, which will be discussed in a later installment.

Method No. 46: *Indophenol on Acetate Silk.*—According to Lawrie, Indophenol may be applied to acetate silk from a vat prepared with 10 parts of Indophenol to 1 part of 76 deg. Tw. caustic soda solution and 7.5 parts hydrosulphite. This gives a good deep blue but is very sensitive to alkalies. It is possible that the use of an ammonia salt, such as the acetate, chloride or sulphate may have some protective action on the acetate silk from the alkali. Also a colloid such as glue might assist this protective action.

Method No. 47: *Indigo on Acetate Silk*—Indigo may

(*Continued on page 379*)

Proceedings of the American Association of Textile Chemists and Colorists

The American Association of Textile Chemists and Colorists

President
LOUIS A. OLNEY
Lowell Textile School, Lowell, Mass.

Vice-Presidents
WILLIAM D. LIVERMORE E. H. KILLHEFFER

Secretary
WALTER E. HADLEY
5 Mountain Avenue, Maplewood, N. J.

Treasurer
WINTHROP C. DURFEE
516 Atlantic Avenue, Boston, Mass.

Councilors
RALPH F. CULVER GEORGE A. MORAN
ARTHUR E. HIRST WILLIAM K. ROBBINS
WILLIAM R. MOORHOUSE WALTER M. SCOTT

LOCAL SECTIONS AND THEIR OFFICERS

Northern New England Section—
John F. Bannan, Chairman, M. T. Stevens & Sons Co., North Andover, Mass
A. K. Johnson, Secretary, Lowell Textile School, Lowell, Mass.

Rhode Island Section—
Walter S. Williams, Chairman, Mount Hope Finishing Co., North Dighton, Mass
Albro N. Dana, Secretary, Franklin Process Co., Providence, R. I

New York Section—
E. F. L. Lotte, Chairman, National Silk Dyeing Co., Paterson, N. J
Daniel P. Knowland, Secretary, Geigy Co., 89 Barclay Street, New York City.

Philadelphia Section—
Elmer C. Bertolet, Chairman, Philadelphia Textile School, Philadelphia, Pa.
Percival Theel, Secretary, Philadelphia Textile School, Philadelphia, Pa.

Southern Section—
Harold M. Chase, Riverside and Dan River Cotton Mills, Danville, Va.
Harry W. Ormand, Secretary, Union Bleachery, Greenville, S. C.

APRIL MEETING OF THE SOUTHERN SECTION

The Southern Section of the American Association of Textile Chemists and Colorists met for the second quarterly meeting of this year at the Piedmont Hotel, Atlanta, Ga., April 18th.

After dinned was served, the Chairman, H. M. Chase, superintendent of dyeing at the Riverside & Dan River Cotton Mills, Danville, Va., introduced Dr. M. L. Brittain, of the Georgia School of Technology, who welcomed the some fifty members and guests to Atlanta. The major portion of Dr. Brittain's address is published herewith.

H. W. Rose, of Charlotte, N. C., Southern manager of the Viscose Company, spoke on Rayon, describing the Viscose process of manufacture. His paper is published in full herewith.

E. F. James, of the Textile Dye Works, Philadelphia, Pa., read a comprehensive paper on "Dyeing of Artificial Silk." This paper is also published herewith. After the discussion on the above addresses the Chairman resolved the assembly into a business meeting.

Mr. Ormand stated the Committee on By-Laws had decided to adopt the by-laws of the New York Section, with the exception that the Southern Section would have quarterly meetings instead of monthly meetings, and with such other modifications as would meet the conditions in the South. Upon motion duly seconded, the by-laws were adopted as above.

Upon motion duly seconded, the Committee on Arrangements was empowered to fix the date and place of the next meeting.

Upon motion duly seconded, the Secretary was instructed to prepare a resolution of appreciation to the Viscose Company for their courtesy in sending down their representative and another gentleman to speak on Rayon.

A rising vote of thanks was given to Mr. Rose and Mr. James. In responding, Mr. Rose said that in advance of formal acknowledgment from his company, he wished to say that it had been a great pleasure and distinct privilege to be invited here; and that he had greatly enjoyed meeting the men of his Section.

Upon motion the meeting adjourned.

H. W. ORMAND, Secretary.

Dr. M. L. Brittain of the Georgia School of Technology welcomed members of the Southern Section to Atlanta. The major portions of his address follows:

Address of Welcome

By DR. M. L. BRITTAIN
Georgia School of Technology

Mr. Chairman and Gentlemen—It is a pleasure to welcome you gentlemen to our great city. As I listened to your names and businesses as you gave them in Rotarian fashion a few minutes ago, I could see, as I had been informed, that most of you come from this vicinity, within two or three hundred miles of the city of Atlanta. So, you already know about this

city, and you take away from me the necessity of saying what is always the Atlantan's proudest wish—something fine about his city.

It is a city of which we are all proud; I never knew a man to live here who wasn't proud of Atlanta and didn't seem to love this city rather more than most men love the places of their abode. Its very bricks, stones and mortar seem to attract the hearts and minds of those who live here; and I heard some of you kindly say awhile ago that you felt something of that same pleasure and charm in coming, and I hope and believe it will be true of everyone of you.

A great professor once said, when he was undertaking an experiment in his chemical classes, "Young gentlemen, be reverent now, we are about to ask God a question," and I think that is a fair statement concerning the kind of work that you do.

Cotton is king. People have said, since the boll-weevil came to Georgia and the Southeast, that it was dethroned; but gentlemen it will never be dethroned; cotton will always be one of the kings of this world, and right here in the South it is bound to be a figure of increasing importance as the years go by. I feel sure I speak to men the majority of whom are associated more or less with the cotton industry. I am proud of the fact that we have a great plant peculiar to the South, as you know, and one that contains in its seed and lint wealth richer than the rich fields of Hebron in the Old Testament. I was down a short time in the cotton mills of my friend John Porter (and I am glad to see his chemist here to-night). I think it is fine that you are teaching our people more and more to take part in this work of yours. It is a little difficult to do that sort of thing in the South; we have the raw material but, without my going deeply into it, you gentlemen know that the South's civilization was originally built on a different order of things, and it is the principal reason we haven't undertaken much in the industrial and manufacturing line.

Cator Woolford, one of the most prominent citizens of Atlanta, is just back from Europe, and told me this curious thing: He said he was traveling in Italy from Genoa to Nice and had met nobody but Italians and he couldn't speak their tongue. He said to one of them, "Do you speak English?" and he said, "I don't speak anything else but." Asked where he was from, the man replied "Georgia." He said he was over there shipping Georgia clay into Italy; they were paying $5 a ton for it in Georgia, sending it to New York, treating it chemically there, and then shipping it across to Europe where they use it in the tile works in Italy and get $75 a ton for that same raw material. This is a fair illustration of what most of us in the South have done in regard to this kind of work that you are carrying on. In an effort to counteract that tendency, we have recently established in our Georgia Tech a department of ceramics, and we hope in a few years to change that kind of thing very markedly. Indeed, through that very department, in its short period of existence, we have already brought two rather large companies down here to middle Georgia in order to handle our Georgia clays.

By the way, in welcoming you to this city, I want to say that we will be glad to see you at Georgia Tech. We are more closely in touch with what you are doing than any other institution in the State. We are doing our best there to establish a great engineering school, and I think so far as funds have permitted, we have had at least a minor degree of success. I think you will agree that Georgia Tech is better known all over the United States than any school in this section. If you are interested in athletics, I hope everyone of you will come down here between September 15th and November 25th this fall and see what we can do out on Grant Field with the various teams of the country; for no matter how strong and fine they are, Teorgia Tech never hesitates to try them, and we will make it well worth your time to go out there for a football game.

I want you also to see our textile department; I believe we ought to have close connection with you. I would regard it myself with a great deal of pleasure, for we are beginning in Georgia—as has been done to a much greater degree in North Carolina and several of the other States—to break away from that old-time Southern way of depending on cotton alone and are trying to put up industrial plants here and there.

Formerly we could see some little feeling and misunderstanding about the sort of work we are doing at Georgia Tech, and a little effort to depreciate it and make it appear as a little lower grade than some of the old-fashioned AB courses. I think that prejudice has pretty well passed away and that our good people in this State are pretty well satisfied that if we have much industrial development in Georgia, it will come largely from the great school out on North Avenue, which I hope you will visit and to which we will welcome you any time you come to Atlanta. It is fine to have you here, and I thank you for the courtesy of your invitation.

The Chairman—I am sure we have all enjoyed Dr. Brittain's address. One thing he said about cotton being king is apropos because we have with us here to-night two gentlemen who are going to try to show in a way how King Cotton can be dethroned to a certain extent. Mr. Rose will now speak on the "Manufacture and Use of Artificial Silk."

Proceedings of the American Association of Textile Chemists and Colorists

The Manufacture and Use of Artificial Silk

By H. W. Rose

The Viscose Company

Mr. Chairman and Gentlemen—Just a week ago I was in New Orleans at the annual meeting of the American Cotton Manufacturers' Association where many cotton manufacturers accused me, as a representative of one of the manufacturers of artificial silk, of going too far in the dethroning of a king of long standing. I fell back on the main argument we have, which is that the use of artificial silk has done more in the last year to market cotton than any other one material factor. I think statistics will show that to be borne out in most piece goods lines.

I want to mention the word rayon before I begin, because I will use it often and have already adopted it, having to use it day in and day out. "Artificial silk" is not only a clumsy term, but it is one that is detrimental to the trade as a whole. It will be a benefit if everybody connected with the trade in which artificial silk is used will adopt the word rayon, from the manufacturer right down to the ultimate consumer.

About this time a year ago a committee met in New York composed of representatives of the merchants, the manufacturers of silk and others interested, and after a tremendous lot of debate over what would seem to be such a small subject, and after considering literally thousands of words submitted from all parts of the country, it was finally decided to adopt the word rayon as a generic word to mean a textile fiber made by chemical and mechanical means from a celulose base. In the first place, rayon is not silk at all. Rayon is artificial, but so is every other textile product that is manufactured, and yet the term "artificial" is not applied to them except where it may imitate something else. The inventor of rayon tried to imitate silk, but the development of the industry has been such that the production has within the last year surpassed the world's production of silk, and it was therefore believed that rayon or artificial silk had reached a position where it could stand on its own legs. The child had reached an age where it could be baptized, and it was therefore baptized with the name rayon.

President Coolidge, at a meeting in Washington, gave the word a good boost by mentioning in his talk that he tried to find it in the dictionary and could not, and I notice one writer says the only place to-day you can't find rayon is in the dictionary.

The words "artificial silk" should not be used, not only because it prejudices the trade, but also because the whole trade is confused by the various terms that can be applied to it. Some call it fiber silk, some art silk, others just silk, and some by the names of the manufacturers.

All down the list there is a great deal of confusion among manufacturers as to just what yarn they are dealing with, and they have to go into it pretty deeply to straighten it out in their own minds as to just what types there are.

Rayon can be adopted as easily as other commercial words. Everyone knows what celluloid is and what bakelite is, and would never think of speaking of celluloid as artificial ivory or artificial amber, nor call bakelite artificial rubber when in the form of a panel for a radio set.

The Making of Artificial Silk

I want to give you a general outline of the principles involved in the manufacture of rayon. The majority of you know the fundamental principles, and I suppose some here are as familiar with the subject as I am, but for the benefit of those to whom it is new, I hope the rest will bear with me while I rehearse the manufacture of rayon yarn from the pulp to the finished yarn as it leaves the plant.

Rayon is made from cellulose and in the finished yarn it is about as pure a cellulose as can be secured in any form, commercial or chemical. The initial steps in the development of rayon were taken in making carbon filaments for electric lights. They wanted to get filaments which would burn free from all impurities, and they hit upon this method because of the purity of cellulose. It had hardly reached the commercial stage, however, before the tungsten lamp replaced the old carbon type and that market went dead, but the success was so great in producing thread from a cellulose base that it was taken up by others and experiments were carried along in an effort to make a thread useful in weaving and knitting. Success was almost instantaneous, and you have undoubtedly read in a great many of the trade journals in the last few years of the tremendous progress made since 1900 and the terrific volume which the business has now reached. About 95,000,000 pounds a year are produced now, which is approximately 20,000,000 pounds a year more than silk. In this country alone 45,000,000 pounds are produced, not counting the manufacturers in England, France, Italy, Switzerland, Germany, Belgium, Czecho-Slovakia and one small plant in Russia.

We take the pulp into our mill like blotting paper in the form of slabs; it is pure white and about one-sixteenth of an inch thick; we receive this from the pulp mills. There are two different kinds of pulp used —cotton cellulose and spruce wood cellulose. Some manufacturers use one and some the other; the viscose process can use either. We take the paper in

bundles and put it in the storeroom until it is ready to run into the plant, after which it is sorted out and weighed. These papers are put into vats vertically and held apart by grooves which allow the liquid to flow in between the sheets. The vats are then flooded with caustic soda of strong solution, and the sheets are allowed to soak several hours, during which time the paper absorbs and is broken up by the caustic soda and swells to such an extent that it is very flimsy and will not hold together. As soon as it has reached its age limit, the caustic soda is run off and the slabs are squeezed together. They are then lifted out by hand (the workmen wearing rubber gloves) and the slabs are thrown into a large vat known as the beater, in which is a mechanical beater which tears the slabs to pieces, the process being to break up from the cardboard form the cellulose which has now been through a type of mercerization in the caustic soda bath. When the machine is running it looks like a large vat of whipped cream. It would feel very much like damp sawdust if picked up. From these vats the pulp is emptied into small pans and laid away for storage. This is one of the very important parts of the process, although in going through the plant one would think it very unimportant, because it is just left stored in this room. But the temperature is kept accurate to the fraction of a degree day in and day out. The time the pulp remains in that room is accurate to the minute, although it remains in there several days, and all these factors, temperature and time, have a great deal to do with the success of that lot of pulp when it is spun into the finished yarn. From the aging pans it is taken to another part of the plant and put in vats into which there are tubes. Bisulphide of carbon is allowed to flow into the vat and mix with the pulp. It is perfectly clear at first, but soon turns to a dark orange color. It is also gauged very accurately as to the amount which goes into each vat, the pulp having been measured correctly, and is allowed to mix for a certain length of time. The tub is revolved, something like a washing machine, except that this tub revolves in the same direction all the time. After it has finished its length of time in these tubs, the pulp is poured on the floor and pushed down a tube to the floor below into large tanks, and there water, caustic soda and a little more of the bisulphide of carbon are added. The pulp now becomes a xanthate, and is an absolutely pure fluid, having no granules or sediment except a small fraction which is strained out later.

Fundamentally it is now ready for spinning, but goes through a few more processes before it reaches the spinning room. It is pumped into another tank and then strained through cotton cloths. There are three stages and in each stage it is strained through several layers. That takes out all impurities and all the granules, so that when the fluid subsequently reaches the jets, it will not stop them up and cause loss of filaments in the yarn. From there it is put into another steel tank where it ages and is pumped to the spinning room overhead.

All the way through, the cellulose is undergoing constant change and the element of time at every stage, and, as a whole, is extremely important for the success of the final yarn. This factor is one reason why so many companies have invested millions of dollars and failed before they marketed a single pound, because experience only can tell just how long, and just how much of the pulp should be used. It is something that can't be found in text-books, even though the fundamental formulas might be known all the way through.

The Spinning Process

The spinning room is constructed like the ordinary cotton spinning room and resembles the cotton rooms in many respects. The spindles are placed in the back part of the frame; in the front of the frame is a long trough. About half way down are the jets through which the fluid is forced by pumps, and the trough is filled with coagulating fluid composed of sulphuric acid in weak solution and a few other chemical compounds. The fluid resembles molasses in color and texture by the time it is ready to be spun, and is known as viscose, as named by the inventors of the method, Messrs Cross and Bevan.

(I am speaking, by the way, mainly of the viscose process, because I am more familiar with that than I am with the acetate, cupramonium or nitrocellulose process.)

The fluid is a brownish orange color and sticky. A glass tube surrounds the end of the feed pipe from the main feed which comes from the tanks below the spinning room. The end of the glass tube is fitted with a platinum die about the size of a dime and perfectly smooth on both sides. It is in the form of a cap which fits over the end of the glass tube. In this die are drilled holes as small as the manufacturer wishes the filaments in the finished yarn, varying in number from 15 to 60. You would have to hold the die up to a strong light to learn that it had any holes in it, because they are not apparent to the naked eye. The pulp is forced through this die by an individual pump on each jet. Of course, the whole is under compression from the tanks below and forced up to these small pumps, but each jet has its individual pump which forces the liquid through at a fixed speed. The speed with which it goes through is very important, because if it is too great the thread will be oversized, and if the speed is too slow the thread will be too

thin. The operator places his finger on the end of each as the dobs drop off, runs it through the coagulating fluid, and touches a cylinder revolving at a terrific speed. The cylinder or box is revolving on the spindle and the thread runs down through a hole in the top of the box, with the liquid on it, and drops to the bottom, but immediately upon contact the centrifugal force throws it out to the side. Revolutions of the box put the twist in the yarn as fast as it is drawn from the jet, and by the time the yarn has traveled about three feet from the jet to the spinning box it has sufficiently coagulated so that such thread will remain intact and not stick. The yarn flows off continuously until the boxes become filled, when it automatically cuts off and the operators doff. When it is doffed from the box, it resembles a cheese very much; it is the same diameter as the box but hollow inside.

Final Washing

The spinning is now complete. The subsequent processes are merely to wash out the chemicals which have been used in breaking down the cellulose and in coagulating the filaments. The cakes are taken into the reeling room and are there reeled off into skein form, which they retain until they are shipped out to the manufacturers, or used for warps or quills. The yarn can then be handled in all subsequent washing stages. It is put on rods and run through machines which pour pure water on it, and is revolved and given a thorough washing, then put into ovens and dried out to a certain humidity content and then put on racks and stretched. The stretching is important for the luster. After being thoroughly washed, during which process it is also bleached, if bleached yarn is desired (and on which subject you will hear more later), it is put into the sorting room and sorted to grade. The best yarn is put into "A" quality and any yarns showing flaws, such as slubs, excessive knots, broken filaments or any other discrepancies, is taken out of the first grade, and put into B, C or inferior grade, according to how bad it is. The yarn is then weighed, bundled and sent to the shipping room.

Industrial Uses of the Finished Product

In talking to cotton mill men around the country, some who have heard so much about rayon that they are tempted to give it a trial, hesitate, thinking, "This thing is developing tremendously, but maybe it is just a flash in the pan. If we steer clear of it a year we may all be back on the staples again." But the tendency for the past several years has been growing steadily away from the old staple demands, and it is becoming increasingly dangerous for a mill to tie up with one thing and depend on marketing it steadily. Novelties have reached such a terrific demand during the past year because of the ability of a few mills to drop staples when the demand stops and to create new fields by creating new designs.

The rayon business has grown up on two different demands, the first being for purely decorative purposes. Its high luster—it being more lustrous than natural silk —led it to be used to brighten up a great many patterns. It has the same effect as varnishing an oil painting; it brings out the color. Put into cotton goods, it will brighten up gingham or dress goods where the ordinary pattern would remain comparatively dull. Then later on, when the yarn was perfected to such an extent that it was less harsh and had a great many more mechanical properties, it was more serviceable to the trade, and having become more impervious to water and strong enough to stand washing, the trade demanded it not only for decorative purposes, but for utility as well. To-day there is any number of textiles into which it goes. The hosiery mills turn out millions of dozens of stockings every month, made from pure rayon thread, and repeat orders are constantly coming in, because the yarn has reached a stage where it can put up with the wear of ordinary silk hosiery. The cotton mills have found it perfectly good for the entire filling in shirtings. I was talking recently to a shirt maker in New York who was formerly skeptical of rayon because he thought if one laundered the shirt, the rayon would all run down the waste pipe and there would be nothing left but the warp. To try it out he made two shirts and wore them. At the end of every week he put them in the laundry. After a year and a half they were still going as well as ever. He was so tired of the patterns he threw them out, but the goods were still unbroken.

Rayon's use in upholstery has been brought about by its peculiar property of being more slick or slippery than any other textile. It is really more serviceable as furniture covering than any other textile except horsehair, which is, of course, obsolete.

Drapery manufacturers have found it extremely serviceable. It not only gives a decorative effect, but also its dyeing properties are such that it can be easily combined with cotton and they can get two-tone effects with cotton in the same shade, as well as strong contrasts of color, which cannot easily be gained with silk. The fact that rayon is a vegetable and not an animal fiber is probably one of the main reasons it has made a name for itself in the trade and reached a demand greater than that for silk. You can do with it a great many things you can't do with silk, which requires a different type of dye altogether. On the other hand, it can be combined with silk, and the silk mills are finding new uses for it, in conjunction with their own patterns. They not only get cross dye effects, but two-tone effects, and in some cases the union of the same color with both yarns in one pattern.

The mill men who are timorous about starting are

greatly in the minority. There have been to my knowledge over a score of cotton mills in the South which have installed silk machinery, and the installation of such machinery proves conclusively that they know rayon is a product that is here to stay. A few days ago Herbert Hoover made the startling announcement that the automobile was here to stay. To most of us this is a self-evident fact; and those of us who have watched the development of rayon and seen its production increase every year are just as sure that rayon is here to stay as they are of the automobile.

The cotton mills and manufacturers in general are depending to a great extent upon the dyers to get them started in the use of rayon, many of them hearing more of unfavorable results in dyeing than of mechanical problems. The latter they know are easily worked out, and there has not been a mill in my territory which has given up in discouragement because of any difficulties in using rayon yarn. In the dyeing of rayon problems have developed during the last few years with the varied demands of the mills. As the manufacturers are depending on the dyers to back them up in working out their problems, a consideration of the utmost importance to the whole trade, and it is for that reason that I am particularly gratified to see an organization like this take an interest in rayon and in these problems which are confronting the trade to-day and which are continually being solved.

After the meeting I will be glad to answer any questions I can about rayon.

The Chairman—It is customary to have a discussion of the paper after it is read, but we are interested both in the manufacture and dyeing of rayon, and as Mr. James is going to talk on the dyeing and treatment of rayon, we will hear his paper first and then join in a discussion of both subjects at the same time. I take pleasure in introducing Mr. E. F. James of the Textile Dye Works, Philadelphia, Pa.

Mr. James—Not having had great experience in extemporaneous speaking, and not wishing to take up any time with repetition, I have written out the paper I wish to present to you gentlemen, with the hope that it might be more helpful to set down the various points involved in a little more detail than I might be able to do from memory. Of course, those who have known me as an oil peddler and tapioca flour salesman in the past will wonder how I can speak on artificial silk; but I have been interested in the dyeing of artificial silk in a financial way for some years, and for a year and a half have given my entire time to it. My partner supplies the technical information which I personally do not possess; so I have prepared this paper more or less in collaboration with him, and it is a great pleasure to present it to you gentlemen. I am fortunate in having as a dyer a gentleman who is the third generation of dyers in his family and who has handled practically every known textile fabric in dyeing and printing establishments.

The Dyeing of Artificial Silk

By E. F. James
Textile Dye Works

It has been said that there is nothing new under the sun, but as in the case of all of the old-time adages, this, too, has its exceptions. Certainly, artificial silk, or rayon as it will be called hereinafter, is as strictly a modern invention and development as anything could possibly be, originated as far as the granting of patents is concerned, by Count de Chardonnet in 1884, and becoming an important factor in the textile trade only within the last few years.

While the improvement in the quality of the article itself, under the capable supervision of men still active in its production, has been superlatively wonderful, nothing in the history of any new industry with the possible exception of the automobile, has ever indicated such marvelous growth with such a diversity of uses.

To the extent that every human being in every civilized or semi-civilized country of the globe is an actual purchaser of woven or knitted fabrics, so is each one a probable consumer at some time or other of rayon in some form. During the last few years, in addition to such fabrics as are made entirely of rayon, it has entered tremendously into the production of every class of goods connected with the cotton, silk, woolen and linen industries, not to speak of the many specialties apart from the more important branches of the textile industry.

Europe and the United States, and more recently the Far East, have taken to this truly remarkable fiber with decided enthusiasm and intelligence, not only from the standpoint of manufacturing the rayon yarn itself, but thousands upon thousands of textile manufacturers are directing their energies to the present defined uses for the fiber, and to its future possibilities.

To most of the long established branches of textile manufacturing, rayon is an article easily adaptable for use in conjunction with other yarns, principally (1) as a decorative yarn appearing at intervals in warp and filling, (2) as the entire filling with warps of a different character of yarn, and (3) twisted with other yarns in contrasting effects in both woven and knitted fabrics, or plaited in the latter.

One reason for this ready application is that rayon comes to the fabric mill as a finished article, requiring upon the part of the knitter or weaver no preparatory equipment such as pickers, cards, spinning frames and other intermediate machinery. In fact, we so frequently arrange for our trade the entire processing of rayon such as coning, copping, sizing, beaming and twisting that many mills seem to us well established in the use of this

product with no additional space or machinery of any kind.

Another factor contributing largely to the growth of rayon is its stability of price, relieving the mill management of the uncertainty of cost so troublesome in the case of all other textile fibers. Made from cotton or wood base, the manufacturers of rayon have such steady and tremendous resources from which to draw, that price changes on their product are never likely to be radical, and even less likely to be frequent.

The value of rayon is in no small measure due to its unusually high luster, contributing to fabrics otherwise dull by comparison effects much more pleasing to the eye of the ultimate purchaser of the merchandise. One can hardly overestimate this point, in view of the present day tendencies in attire, particularly feminine, when one finds it decidedly difficult to describe the average lightweight garment of outerwear without using the words "bright" and "brilliant."

Factors in Dyeing Rayon

To the highly important facts regarding the ease with which rayon can be handled in mills equipped for another type of yarn, and the value of its characteristic luster, is added the fortunate situation that it can be dyed with all types of dyestuffs known to the industry as being applicable to the dyeing of cotton. While many problems have been presented to the dyer of rayon not usually found in dyeing cotton—and the careful handling of rayon is of supreme importance against the relatively rough treatment possible with cotton, it was a tremendous advantage in working up to a huge volume in a short space of time, to know that in dyeing the fiber the choice of colors could be made from so large an array already being produced throughout the world in quantity.

As a result of this, the attentions of the dyer could be concentrated upon dyestuffs which possessed:

1. Level dyeing properties at the particular temperatures most desirable on rayon, this applying to all classes of dyeing regardless of other considerations.

2. Fastness to washing, either characteristic with the dyestuff itself, or in being suitably effected by after-treatment, for use in fabrics likely to be laundered from time to time.

3. Fastness to light, for use in the case of goods to be exposed to sunlight, such as ladies' dress fabrics, and window draperies.

4. Fastness to bleaching, for goods which are to be bleached in the piece, such as shirtings.

5. Money value.

The placing of the dyestuff cost at the bottom of the list is done advisedly, since in all cases the intelligent and conscientious dyer will realize that his prime considerations must be those which bring about the best results according to the uses to which the yarn is to be put. Our observation and conclusion has been that in dyeing rayon, more than the more sturdy fibers, perhaps, it is invariably best to strike toward the selection of dyestuff in every case which has shown itself to be of the greatest value to the ultimate user of the fabric, considering money value in the cost of the dye only in case two or more products are shown to have equally commendable features.

Testing for Fastness

Even after a most complete recapitulation is made of the many dyes necessary to use in a custom dyehouse such as ours, it is necessary to continually investigate and experiment along the same lines. This is due not only to the very frequent offerings of new colors by dyestuff manufacturers, and their constant efforts to improve existing products, but also to the new uses found for rayon and the tendency in the trade toward better value in the fabrics made and the guarantee of fastness necessary in merchandising them.

In our own plant we maintain a most complete laboratory equipment, which is constantly in use under the personal supervision of my partner, Mr. Walsh, largely in dyestuff investigation. Recently in a specific study of colors selected for fastness to light, the extent of the offerings made advisable the employment of an outside chemist, as we felt the necessity for absolutely impartial judgment. He came to our plant and tested over two hundred dyestuff samples. Small skeins were prepared for the purpose, one dyeing of each color being made strictly for shade, another for a washing test, and the third to be tested for fastness to light.

The sample for the washing test was braided with white yarn, washed in an olive oil soap solution at 130 deg. Fahr., and the conclusions noted as to staining the solution and marking off on the white yarn. As to the fastness to light which prompted the special investigation, we have the samples, each exposed on one end only, in a cabinet on our roof where they are subject to the sunlight all day long. We expect shortly to have more complete data than has ever before been available to us.

All brands of rayon produced on a commercial basis except the acetate yarns are dyed in approximately the same manner as far as selection of dyestuff and method are concerned. The world production of rayon to-day is divided about as follows, from which it can be seen that the methods described and the action of dyestuffs will apply to approximately 99 per cent of all of this fiber produced:

(a) Nitro cellulose, 18 per cent, this being the original product invented by de Chardonnet and now used in the Tubize plants.

(b) Cuprammonium, 5 per cent, most of which is produced in Europe.

(c) Acetate cellulose, 1 per cent, of which the well known celanese is the principal one in use, and

(d) Viscose, 76 per cent.

The latter is the only one of those mentioned which permits the use of either wood or cotton as a base, and is the method employed by three of the four largest producers in the United States.

The Dyeing Process

Practically all dyeing of rayon in skein form is handled in open kettles or tanks, no machine having as yet been perfected which has been satisfactory enough to warrant its general adoption, either as to quality of work or production. These kettles are made of wood, copper, or Monel metal. We have found the Monel to be decidedly advantageous in spite of high first cost, not only because the strong caustic solution present in dyeing vat colors has no deteriorating effect upon the tanks or the shade being dyed, but also because the Monel metal is so readily cleansed that a light shade can immediately follow a dark one with a minimum of time lost in cleansing during the interim. Practically our entire plant is Monel equipped.

The skeins are suspended on bamboo sticks or some of the specially prepared poles on the market. Usually two sticks about ¾-inch in diameter are used as a unit rather than one large stick, especially if bamboo is used. The skeins should be spread out so that in dyeing they will not overlap and prevent even penetration of the dye.

The yarn is first wet out in a bath of soft water, the method of preparing the bath varying according to the class of dyeing, character of the yarn, and the ideas of the dyer as to the temperature and ingredients necessary to produce the best results. The dyestuff is then added, after proper reduction. In some dyehouses, the lots are started at a comparatively low temperature, and during a progression of steps at various temperatures the several additions of salt and chemicals necessary to obtain the shade and desired fastness are made, the yarn being given the predetermined number of turns at each step. Other dyers prefer a method of entering the yarn at a temperature extremely high, possibly 190 deg. Fahr. Many contributing factors must be considered in working out this feature, and each dyer will have ideas on the subject to support his method of handling.

The temperature in dyeing, either extremely cold or very hot, has no effect of tendering or dangerously affecting rayon, but extreme care must be taken at all times to handle it carefully while wet, owing to its lack of tensile strength when in that condition.

Importance of Good Winding Condition

One of the most important points involved in dyeing rayon in the skein is to keep it in good winding condition. Either wet or dry it is a smooth, slippery fiber, and the turning of the yarn in dyeing requires the most skillful handling and constant vigilance to prevent the cotton tie bands from slipping and tangling the skeins so they cannot be wound economically. In the United States all manufacturers of rayon use cotton tie bands, which slip less readily than those made of rayon itself. One of the reasons why most of the foreign rayon yarns have not been successfully used when skein dyed is that they have rayon tie bands, making the yarn more difficult for the dyer to keep in winding condition even with a minimum of handling in the dye bath.

Those dyers who are successful to-day are in almost every case the ones who have a reputation for sending out work which winds well, whereas many others probably equally as skillful in matching shades have not succeeded as well because they have not so completely mastered the art of retaining the original winding properties of the yarn. It is an unfortunate fact that many custom dyers have had little opportunity to study the subsequent operations through which the product must pass, and not only cannot appreciate what the user is up against in winding, but as a result cannot train the dyehouse help to properly dress and finish the yarn, not knowing sufficiently well how it should be to wind well. We have found it decidedly advantageous if not absolutely necessary to go into all of these points thoroughly, and such success as we have had dates from the time we worked out methods of handling which resulted in good winding.

The Importance of Careful Handling

In the case of ordinary direct colors requiring a minimum amount of handling while being dyed, it is an easier matter to keep the yarn in good shape, but dyeing classes of faster colors, particularly vat dyeing, requires a much longer process as a minimum, and it is here that efforts made to handle the yarn carefully bear fruit.

A custom dyehouse is called upon to produce thousands of shades in a comparatively short time, and considerable skill and wide experience are necessary if the shade is to be dyed with the least amount of handling. Rayon has a remarkable affinity for dyestuff, and each operation must be carefully planned and known before starting the lot, to get the color on evenly and with the fewest number of turns. Not only is it seldom desirable to make additions to obtain the shade, each addition requiring a certain number of extra turns of the yarn, but there is even a point beyond which it is best in the long run to put the yarn into black and start a new one for the shade wanted. If for any reason it becomes apparent as

the dyeing proceeds that there is to be any unusual difficulty in obtaining proper results, we find it better to replace the lot with yarn of our own of a similar quality, and start again rather than to go so far with the original lot that it might not wind well if it should eventually have to be put into black anyway.

In the case of cotton and other fibers, color can be boiled on evenly, or if too heavy or uneven can be stripped off, but it is seldom that either method can be used on rayon, if it is to retain its good winding condition. A lot partly dyed a lighter shade and put into black without removing from the kettles should never be any the worse for having been started in another shade, provided it is handled with reasonable care and judgment. While the percentage of lots desirable to redye into black is small in a well conducted dyehouse, it is always a very advantageous thing for all concerned if the user includes black in his range of colors.

The knitting trades and weavers of broad silks, ribbons, trimmings, jacquard draperies, and others, have recognized this, and have been able to make up their lines of goods containing a certain percentage of black rayon with good results.

A custom dyer usually has some outlet for yarn which he has replaced, and which he must salvage after redyeing, and while it is always a loss to him, it removes temptation to send lots out which might cause the customer a loss of production or an added cost in winding, weaving or knitting. If this was not the case, prices for custom dyeing would most certainly be considerably higher.

It is unfortunate that most cotton mills using skein-dyed rayon, and most mills making plain or dobby draperies and dress fabrics with rayon filling or in the warps, are unable to make any use of black. We might even go so far as to say that one of the principal factors which has decided many cotton and drapery mills not to attempt their own dyeing of rayon has been because they have no economical way to salvage lots which do not come up to expectations, thus adding greatly to their costs, or reducing the value of their production because of increased percentages of seconds.

Loss in Weight

The question of loss in weight sometimes comes up in connection with dyed rayon, and it might be of interest to have this subject explained. Some brands of the fiber are of such a nature that there is practically no loss of weight in the actual dyeing process, whereas others, and this includes most of the important ones, lose a slight amount, depending upon the class of dyeing to some extent. In the drying process following the dyeing, however, there is apt to be an immediate and more considerable change, which is then subject to regain as we will explain.

In the manufacture of rayon, it is customary to turn out a product automatically conditioned to contain about 9.9 per cent moisture, which has been found best suited to almost all purposes for which the yarn is likely to be used. Naturally drying under heat after dyeing results in some of the original moisture being removed. This reduction is apt to reach as high as 5 per cent in many cases. Immediately upon cooling down, however, the yarn begins to pick up moisture from the air, and the longer it is exposed to the atmosphere the more nearly it approaches its original weight. Usually a custom dyer or even the dyehouse of a mill is so pressed for deliveries that it is seldom that a lot is allowed to air up until it regains the entire loss in weight, but is delivered to the winding rooms when it has cooled down sufficiently to be finished and packed. Since rayon winds best when it is driest, within reason, it is unnecessary for it to completely regain its original moisture content from a winding standpoint. Some dyehouses have found it necessary to install conditioning apparatus to quickly bring the weight back after drying, but they do this rather than incur the suspicion of not returning the original quantity of yarn, and not because it adds anything whatever to the value of the rayon. While rayon is bought on the basis of weight, it is consumed strictly on a yardage basis in most cases, so that yardage is the only satisfactory method of determining the yield.

After dyeing, the rayon is whizzed in the various types of centrifugal equipment, being made up into heads, or wrapped in cloths to prevent injury to the fiber during the extracting. It is then opened up and put through the dryer. High temperatures in drying are inadvisable, the best medium being properly circulating warm air. A low air velocity must be maintained so that the skeins will not become tangled. Continuous pole or apron dryers, or truck dryers are usually used, both equipped with steam coils and circulating fans. Some concerns use dry rooms if the element of time is not so important, but the results, on the other hand, may not be so satisfactory.

The yarn, after drying and airing, receives a careful dressing and inspection, as well as sorting, according to the class of goods to be made. It is impossible to stress too strongly the importance of this final inspection and sorting according to the customer's needs. We have found that in order to give our trade the utmost service it is practically necessary to know how every lot is going to be used, even to the type of loom or knitting machine on which it will be handled, and particularly the fabrics to be made.

Light and Dark Skeins

Grant that the quality of rayon from every standpoint including dyeing properties has been marvellously increased and improved upon in the last few years, we must still consider that there are certain varying per-

centages of skeins in all brands which do not take the dye in the same manner or degree as the balance of the lot. This creates a condition which we commonly refer to as light and dark skeins, which has no relation to uneven dyeing as meant by such defects as may be controlled or overcome by the dyer.

The skeins, evenly dyed in themselves, are simply of a different shade from the balance of the lot; in some classes of dyeing this condition is seldom apparent, and some shades in any class of dyeing seem to cover up all indications of the defect. In some shades of blue, orchid, and flat shades such as taupe, it is apt to stand out more prominently. It is not always present by any means, and even in the shades mentioned, the percentage of lots put through with any amount of light and dark skeins is usually very small. We find it necessary to be constantly alert and very rigid in our inspections, and we not only caution against the possibility of receiving light and dark skeins, but we also endeavor to sort each lot strictly according to the fabrics to be made. Obviously if the yarn is used to make a narrow stripe in shirting, or a single end stripe at intervals in cotton dress goods, or a fancy stripe in the top of a golf stocking, or even if woven in any pick and pick fabrics, the light and dark skeins are apt to be entirely broken up and their importance is slight. On the other hand, a 4 by 1 box loom weave, or a single shuttle solid color drapery would show up immediately any skein not a close match to the rest of the lot. Our inspection is based upon all of these things, and best results are obtainable by having this complete knowledge of the customers' conditions of use. The customers' winders and weavers must also continue this inspection, and check the work as it passes through their hands.

Softening

The matter of soft finish is important in connection with dyeing rayon yarn. As it comes from the manufacturer, rayon is usually soft enough for the weaving trades to use without treatment of any kind except possibly a slight amount of oil sprayed on during the winding process, or fed by means of a wick or roller when transferring the yarn from skein to spool or bottle bobbin on the winding machines. The knitters of rayon in the natural usually need a softer and better lubricated yarn than the weavers, so that they will have less breakage in passing through the needles. It is customary for them to oil it well in some manner, either by greater quantities of oil sprayed on in the winding, or by soaking the yarn in special oils prepared for the purpose, and then whizzing, retaining in this way a considerable quantity of oil throughout the knitting process. The amount of oil in either case must be governed by the class of goods to be made, a considerable amount being used only in case the goods are to be thoroughly washed in the finishing processes. In the event that the goods are dry finished, as in the case of children's fancy ingrain socks which are usually boarded dry, many mills have the dyer put the yarn through a softening bath in the same manner as though it was to be dyed, and in some instances it is dyed a blue white at the same time. Some brands of rayon are, of course, softer than others, and we are given to understand that in the next few months the Viscose Company is to put out a yarn which will be soft finished, and will eliminate the necessity of oiling or using any other lubricant when the yarn is used in the natural.

In dyeing rayon, however, the softening is done in conjunction with the dye bath, or following the dyeing operation on some classes of colors. All dyed rayon should be turned out soft enough for any purpose to which it is usually put, and it is inadvisable to use any further oils in processing it. Even with the highest types of so-called stainless oils, the shade is apt to be affected and many oils will leave an odor in the finished goods. The exception might be in the case of vat dyed rayon used in fabrics to be boiled out and bleached or dyed in the piece.

With regard to the handling of rayon in the dyehouse and all other places where it is used, it must always be kept in mind that it is a delicate product, composed of a number of very fine filaments, and it is easily injured by contact with rough surfaces or edges of any kind. All equipment must be smooth, dye sticks and dryer poles must be constantly inspected to eliminate any which might cause the yarn to catch on defective spots and result in excessive breakage. After the final inspection, it must be carefully baled and wrapped for shipment. We have found it necessary to construct special baling presses of a different character from those used on other yarns, with a capacity of 10-pound and 20-pound units respectively, as well as intermediate or smaller quantities.

Bleaching

In considering the character of rayon best suited to dyeing, in the skein, one important tendency is toward the increased use of bleached yarn. There is hardly any doubt that the bleached bottom is an advantage on the more particular classes of fabrics to be made, and results in less dyeing imperfections in many cases. Even when it might be entirely unnecessary to have the bleached yarn, it at least has no undesirable features, from a dyeing standpoint.

It is a tremendously fortunate situation that the manufacturer of rayon is enabled to bleach his product at small cost and with very little additional handling, none of which is disturbing to the yarn itself. In cases where the dyer is called upon to bleach rayon, the yarn must be put through fully as many operations and have as much handling as if it were dyed, and the cost is almost as much as for the cheaper classes of dyeing.

In order that you gentlemen might have an idea of the interesting process of bleaching in use by the rayon manufacturer, it was my privilege to visit the plant of the Viscose Company at Marcus Hook, Pa., and in collaboration with C. C. Bassett, Jr., and Frank H. Griffin, the latter being technical manager, we are outlining the points involved.

To insure the even dyeing of rayon, the manufacturer realizes that the yarn must be clean, pure, and of regular chemical composition. It is perfectly obvious that yarn impregnated with impurities, such as calcium salts, for example, would have an entirely different dye factor from one devoid of such salts. The change of color shown by Alizarine Red S on yarns containing lime salts is a typical illustration of this point.

Again, if salts from impure water are left as a residue in the yarn and the yarn is afterward finished with soap, the insoluble lime soaps formed blotch the fabric, and have a considerable delustering effect on the silk. Hence, it is of utmost importance that all water used in the bleaching operation must be soft and pure.

The bleaching process as used at the Viscose Company consists of the following steps:

(1) The yarn is washed in pure, soft water.

(2) It is treated with a soda bleach, or sodium hypochlorite, of a strength which is varied according to the kind of yarn and size of filament, until the yarn is of a standard color, the time usually being about twenty minutes.

(3) It is then soured in muriatic acid for approximately ten minutes.

(4) It is washed in pure water.

Following the washing the yarn is whizzed, dried, humidified, and passed to the sorting rooms in the same manner as other yarn.

Types of Colors for Various Uses

To return to the matter of dyeing, we will outline the character of colors suited to the various fabrics to be made from skein dyed rayon, and have grouped in a general way the principal classes determined upon for our trade. We will describe these particularly with regard to their points of interest from a mill standpoint.

There are vast quantities of skein-dyed rayon yarns used in the manuufacture of sweaters, neckties, mufflers, scarfs, ribbons braids, wire covering, and a myriad of novelties both knitted and woven. Practically none of the articles named are likely to be laundered, and those which may occasionally be subjected to washing are likely to be handled with due regard for the fact that the colors are not apt to be very fast. For this reason it is customary to use the ordinary type of direct dyestuff without regard to fastness in dyeing the rayon in the skein for the purposes named. All efforts are concentrated upon getting the proper shade and having the yarn evenly dyed and in good winding condition. We, of course, know that many other fabrics are made up with yarn dyed no faster to light or washing than those described, but when it is considered that the faster colors other than vats cost very little more in many cases, we do not recommend this class of dyeing to any cotton mill except under special conditions. It sometimes occurs, for example, that a purchaser of draperies will insist upon the use of the cheapest colors, and leaves the mill with no alternative except to obtain what is specified.

The next group is what we designate as washable colors. They are usually recommended where fastness to light is of lesser importance, but where the dyed rayon is to be used in goods sold as fast to washing, with either white or lighter colored yarns as a part of the fabric. This group of colors includes not only those domestic and imported dyestuffs which in themselves are extremely fast to washing, both direct and developed, but also those which properly after-treated are rendered capable of standing the rigid tests which they must pass. It is seldom that this group suits the purpose of cotton piece goods mills, although some of it has been used in decorated ginghams. It is planned principally for children's ingrain stockings in which considerable white yarn is used, and for decorating fancy tops in all kinds of sport hose. It can be used to advantage in braids and other trimmings for middy blouses and light-weight dresses, if the price for Indanthrene colors is too high for the quality of the goods.

The group more widely used than any other in piece goods weaving of all kinds is what we term the sunfast colors. This is comprised almost entirely of imported fast-to-light colors. Careful selection and the determination of the fastness characteristic of each color chosen has resulted in a class of dyeing of great value. Used straight, as many of our customers find it advantageous to have us do, these colors possess a degree of fastness to light when dyed in the proper manner that is practically equal to some of the vat colors, and even in combination as is more largely the case, they show up remarkably well. Not only are they fast to light to an exceptional degree, but they stand up extremely well in all washing tests at reasonable temperatures.

Probably the greatest call for the so-called sunfast group is from the drapery and upholstery fabric weavers, and mills are using yarn dyed with this type of colors for everything from the most flimsy summer goods to the heaviest close pick damask weaves. We usually recommend this class of dyeing for ginghams or any other types of light-weight dress fabrics, or any other worth-while goods which do not warrant the price of vat dyeing. The cost is so little more, compared as to the additional value, over the price of the cheapest work and colors, that we seldom find any mill weaving goods which carry any

claim for high quality where the selection of this grade of dyeing is not advisable rather than the cheaper ones.

The highest type of dyeing on rayon is that with vat colors, commonly known as Indanthrene, although that is merely a trade-mark of one of the large producers in Europe. While even in this group selection must be made according to the type of goods to be made, as some are faster to light, or bleaching, than others, it is possible to select a range of colors which are absolutely indestructible, in their usual commercial treatments involving light tests, or bleaching in the piece.

The vat colors are used in dyeing rayon which is to be put into the finest grades of guaranteed draperies, and probably because this is used usually for filling, the largest volume of vat dyed rayon goes to this class of trade. Of even greater interest to the average cotton mill, however, is the fact that this class of work is adapted for use in putting stripes and decoration in shirtings and similar goods which are to be bleached in the piece, and there has been a gradual and substantial increase in the development of patterns of this character. Vat dyed rayon is also used in woolen and worsted goods which are piece dyed, this cross dyeing feature being more widely used from season to season. The colors in this class also stand fulling and scouring necessary on worsted fabrics

Cross Dyeing

We are frequently asked whether it is possible to treat dyed rayon so that it will resist in cross dyeing with direct or vat colors, in making up cotton piece goods. We are certain that there has never been found a practical method of doing this in quantity, or at least one which could be used promiscuously. We have dyed rayon with vat dyes to use in decorating cotton piece goods which were bleached in the piece and then cross dyed with direct colors to give a light ground on the cotton, but the piece dyed ground had not only to be delicate in shade, but even then it topped and altered the shade originally dyed on the rayon skeins. It would be possible to work this out economically and obtain some beautiful effects, but the idea is strictly a converter's proposition, and not one which can be handled by most gray goods mills.

Skein dyed Celanese used for decorating cotton piece goods or hosiery will stand bleaching in the piece, but even when dyed with the special colors provided by the manufacturers, it will not always stand the temperatures necessary in boiling out the cotton or in cross dyeing it. The greatest use for Celanese for cotton goods lies in the advantage of weaving in the gray, and converting into shades piece dyed as wanted, but its use for the time being is restricted by its first cost.

Speaking strictly from a dyeing standpoint, there is no particular difference between A, B and C grades of rayon, but for the average weaving or knitting proposition the A grade is much preferred because it winds and weaves or knits best. B grades dyed with care is quite likely to be as satisfactory as A grade handled more carelessly, so that many mills obtain excellent results using the B grade or a reasonable proportion of it. For vat colors or even the washable and sunfast classes where the amount of handling is more or less considerable, it is always best to use only A grade yarn, and only A grade should be used for warps. The C grade is usually put into twist and other purposes where it is best to dye after converting.

From a consumer's standpoint, it is also well to remember that rayon works best in dry atmosphere. It never winds, weaves, or knits as well on a damp day, and it should never be run at high humidity.

Discussion

The Chairman—The discussion of these two papers is now in order. I think there are many here who have had experience in dyeing and using rayon, and I believe any questions you care to ask can be answered by Mr. Rose or Mr. James, or some other member of the association. We ought to have a very interesting discussion of this subject.

Mr. McKenzie—I understand that NN is made of a cotton base and also that it is bleached in the pulp.

Mr. Rose—Up to March 1st we manufactured two types of yarn; you could get NN which has a cotton base, either in bleached or unbleached. Owing to experience in various angles of the trade and to experiments of our own it has been determined that the bleached is superior, and we are gradually changing our production over to that.

Mr. McKenzie—At what stage of the process is the NN quality bleached?

Mr. Rose—It is bleached in the washing stage. Those are the stages Mr. James outlined. The skeins are laid on the rods and the rods are supported on a trolley at each end, which carries them from one end of the rack to the other. The rod at the bottom is suspended to straighten the skein, which hangs of its own weight. The top rod rests on the trolley and revolves at intervals. It travels without revolving for a few inches, then gives the skein just enough turn so that part of the yarn receives the bleach, and after an interval it turns back again so that all sides are exposed to the bleach. The yarn is showered continuously; none of it is in the vat.

Mr. McKenzie—When the viscose comes off the spinning frame, it comes on to a great big spindle?

Mr. Rose—No; that is a different type. There are two types, known as box spinning and spindle spinning. The yarn is wound inside a cylinder and has no core at all; it is wound inside out by centrifugal force. Some of our competitors use the box spinning method where the

yarn is spun without any twist on to the drum and washed in that form and the twist added as a subsequent operation. We throw the twist in at the same time we spin the yarn and wind it on to the cone.

Mr. McKenzie—If you can wash it on that spindle, why can't you dye it on the spindle also?

Mr. Rose—It would be a difficult matter to dye it at that stage, because the yarn then contains all the chemicals it had in the manufacture. It goes into the skein form before it is washed and dried. It is taken off the drum before the chemicals are washed out. Also, to get an even dyeing job, it is better to start with a dry skein than with one that has not been dried subsequent to its manufacture; it would be more staple throughout if dried into skeins and then put into the dyeing vat.

Mr. Johnson—We have been making some fabrics of rayon filling, and we notice in dyeing it in the piece we get a distinct mark at intervals. Is there any way of getting that out before we put it in the goods?

Mr. Rose—Some of those points are covered in Mr. James' paper, and that is one reason why he says that in the custom dyeing business it is essential for them to know just what you want to do, so that they can sort it accordingly. In the gray stage, if it is broken up with the two-box loom, it should not know the barred effect. The degree to which it can be eliminated is one of the things the trade is trying to work out. Every mill runs up against it to-day every once in a while. The dyer of the piece goods can completely spoil it or make it first class, according to how he handles it. It the piece goods dyer is on the job and knows the problems and works them out to the best advantage, he should be able to get a first-class piece of goods if you have broken it up with a two-box loom.

Question—In the filling I have at times noticed two different shades, white and cream.

Mr. Rose—Unbleached yarn is a cream color; the pure white is bleached; and they should not be mixed at all. That might have been a discrepancy in the winder. It is something the overseers have to watch very carefully, to see that workers do not mix them.

Question—Is rayon oiled before it is shipped?

Mr. Rose—We ship it out without any oil at all as a general rule. We put about 2 per cent of oil in it if the customer requests it and if we know how the customer expects to use the rayon. With the present stage of manufacture, it winds a little better if oiled. We are working on an especially soft yarn, which we hope to have out in a few weeks, and with that no oil at all will be necessary. There are a great many factors that can make more than one shade in the yarn; the very best of the dyers will find it, I am sure, and, on the other hand, the best dyers do not find that particular effect as much as the ones who haven't had so much experience and haven't worked out the dyeing problems as well as might be in accordance with present knowledge; but there are undoubtedly certain problems in the yarn itself which might give it a shady effect, if the yarn is not dyed with that point in mind. It is the working out of that problem that has caused a great deal of discussion in the trade and caused a lot of experimentation, and many good results have developed. There are many causes, however, that might make a barred effect. The two skeins cannot possibly be exactly alike and there is nothing that will show up the difference in the two skeins quicker than a chemical analysis, and dyeing is, of course, one of the easiest ways to analyze it.

Question—Isn't there some method of treating a whole batch so that you will get down to the same chemical foundation and it will all dye evenly?

Mr. Rose—There is not any that I know of, and I don't know whether mordant would do that or not. That is one reason we have adopted bleaching—because it takes out still more foreign impurities, and a bleached yarn is a more pure cellulose than the unbleached. By bleaching that foreign substance out a purer yarn is made and one which will dye more evenly.

Question—What effect has boiling on rayon, say, if you had piece goods containing rayon and boiled the goods under pressure?

Mr. McKenzie—The minute the rayon gets wet it loses its tensile strength, and the pressure going through will break the filaments. As far as the heat is concerned, it doesn't hurt the yarn, but the mechanical pressure brought to bear on the yarn would be injurious. In dyeing rayon you can carry the temperature as high as you wish and yet not injure the luster or tensile strength.

Question—It is customary to use a weak solution of sulphuric acid after bleaching; I was wondering if that would have any harmful effect?

Mr. Rose—I don't think so; sulphuric acid is used in the coagulating bath to harden the thread, and if it is a weak solution it shouldn't affect the yarn in the finished goods.

Question—How many yards to the skein on a 75-silk dandy?

Mr. Rose—All dandies up to 150 are 1,800 yards, and 150 and over are 2,800 yards. I believe the Tubize Company is making 5,000-yard skeins, and claim it helps production, but we have never made a skein longer than 2,800 yards, because of the fact that if the skeins tangle or if the winder gets into difficulty, the waste is not nearly so great if you have a small one, and the larger the skein the easier it is to tangle.

Question—Is there any certain number of skeins put up in the 10-pound boxes?

Mr. Rose—No; they are put up to weight; they just throw the skeins on the scale until the weight goes down on the 10-pound mark and then throw in one extra skein and bundle it up; the 75 will run right around 300 skeins.

TWENTY-EIGHTH RESEARCH COMMITTEE MEETING

The twenty-eighth meeting of the Research Committee was held at the Chemists' Club, New York City, on April 11, 1925.

The following members were in attendance: L. A. Olney, W. C. Durfee, W. M. Scott, E. H. Killheffer, E. F. L. Lotte, R. F. Culver, A. E. Hirst, H Christison, W R. Moorhouse, J. F. Bannan, R. E. Rose, W. D. Appel and W. E. Hadley.

Mr. Livermore offered a paper in regard to "Fastness of Colors to Hot Pressing and Ironing of Woolen Materials." A paper was received from Mr. Robbins dealing with "Fastness of Materials to Carbonizing and Salt Water."

Mr. Appel suggested that different laboratories be requested to try out the fastness methods which have already been proposed in the 1923 and 1924 Year Books, and that they be asked to criticize these tests, pointing out wherein difficulties may be encountered and give suggestions as to any improvements which could be advantageously introduced.

The committee could prepare materials of different degrees of fastness and submit such samples to various laboratories and see if uniform results could be obtained under different working conditions. It was also suggested that a questionnaire regarding the different tests could be prepared and the responses obtained might serve as a basis for constructive work.

Respectfully submitted,

W. E. Hadley, Secretary.

TWENTY-NINTH RESEARCH COMMITTEE MEETING

The twenty-ninth meeting of the Research Committee was held at the Engineer's Club, Boston, Mass., on May 15, 1925.

The following members were in attendance: L. A. Olney, W. C. Durfee, R. F. Culver, J. F. Bannan, W. S. Williams, W. D. Livermore, W. M. Scott, G. A. Moran, W. D. Appel, W. H. Cady, H. Christison, W. E. Hadley.

Letters of regret for not being able to be present were received from Wallace J. Murray and P. J. Wood.

W. H. Cady and W. M. Scott were designated to prepare an outline of the work accomplished to date, in regard to the fastness of textile material to light, and the best artificial means of producing fading which would be commensurate with the action of sunlight.

W. D. Appel, who has done considerable work in trying out the different fastness methods as published in the first two issued of the Year Book, made a number of suggestions for simplifying the proceedure and in regard to certain changes in the editing. Mr. Appel consented to act as the Association representative, in co-operation with the Chairman of the different fastness committees, and is to be furnished with various samples of different dyed materials, which he in turn is to divide and send to ten different testing laboratories and interested parties, with the request that they try the fastness tests as suggested in the Year Book, using the samples submitted. After such trials are made, they may cite any difficulties which may have been encountered, and offer any criticism which they feel may be of value in bringing the proposed standard tests to their fullest value. By this means, it is hoped to correlate the findings of the various workers and thus make the proposed methods representative for the industry at large.

Mr. Livermore presented a paper bearing upon the fastness tests of dry and wet heat upon textile material. This paper will shortly be published in the Proceedings.

A paper from W. K. Robbins relative to the action of salt water upon textile material was read, and this will be published within a short time.

Respectfully submitted,

W. E. Hadley, Secretary.

THIRTIETH COUNCIL MEETING

At the thirtieth meeting of the Council, held April 11, 1925, full report of which was included in the Proceedings for May 18th, the following applicants were elected to membership:

Active

Bader, John, chemist, Liberty By-Products Works, Belleville, N. J. 227 Williams Avenue, Hasbrouck Heights, N. J.

Boies, Orlow W., chemist, Du Pont Fibersilk Company. Old Hickory, Tenn.

Campbell, Donald, J., bleaching demonstrator, Roessler & Hasslacher Chemical Company, Perth Amboy, N. J. Good Shepherd Apartments, Conestoga Road, Box 34, Rosemont, Pa.

Carter, W. B., dyestuff representative, New York Color & Chemical Company. 1429 Rosewood Avenue, Louisville, Ky.

Clendinning, Thomas C., colorist, Newport Chemical Works. 68 Lafayette Avenue, Passaic, N. J.

Homer, Maurice Bedell, chemist, Chas. Eneu Johnson & Co. Box 165, Morton, Pa.

Janssen, John W., consulting textile chemist. 198 President Street, Passaic, N. J.

Korpanty, Edward J., manager, Columbian Color & Chemical Company, Brooklyn, N. Y. 17 Bittman Street, Maspeth, N. Y.

Kramer, Theodore Z., dyer, Oakbrook Hosiery Mills, Reading, Pa. 614 Lancaster Avenue, Reading, Pa.

Mayer, Frederick W., chemist and superintendent, Anchor Color & Gum Works, Dighton, Mass. 150 Dighton Ave., Taunton, Mass.

Meisenheimer, Todd Bowman, dyestuff salesman, Sandoz Chemical Works, Inc., Charlotte, N. C.

Merriam, Paul A., plant manager, U. S. Finishing Company, Cedartown, Ga.

Moore, William J., textile chemist, Pacific Mills, Lawrence, Mass. 164 Andover Street, Lawrence, Mass.

Newman, Samuel, sales chemist and demonstrator, Kem Products Company, Rahway, N. J. 980 Hopkinson Avenue, Brooklyn, N. Y.

Potter, Chas. D., bleaching demonstrator, Roessler & Hasslacher Chemical Company, Perth Amboy, N. J. 7702 Amboy Road, Tottenville, Staten Island, N. Y.

Seydel, Herman, president and manager, Seydel Chemical Company. 135 Halladay Street, Jersey City, N. J.

Staples, Robert Taft, dyer, Planters and Merchants Mills, New Braunfels, Texas.

Junior

Parkman, Francis, dyer, Ciba Company, New York, N. Y. 9431 119th Street, Long Island.

Seery, Francis T., textile chemist, Roessler & Hasslacher Chemical Company, Perth Amboy, N. J. Y. M. C. A., Perth Amboy, N. J.

Sheffield, Isham V., dyer, U. S. Finishing Company, Cedartown, Ga. 113 Essex Street, Cedartown, Ga.

Warshaw, Floyd F., textile colorist, Newport Chemical Works. 13 Martha Place, Passaic, N. J.

Albert Darbey was transferred from Junior to Active Membership.

THIRTY-FIRST COUNCIL MEETING

The thirty-first meeting of the Council was held May 15, 1925, at the Engineers' Club, Boston, Mass.

The following members were in attendance: L. A. Olney, W. C. Durfee, R. F. Culver, J. F. Bannan, W. S. Williams, W. D. Livermore, W. M. Scott, G. A. Moran, W. E. Hadley.

Letters of regret at being unable to attend the meeting were received from A. E. Hirst, E. H. Killheffer, F. L. Lotte and W. K. Robbins.

The following applicants were elected to membership:

Active

Beauregard, Roy J., chemist, Aberfoyle Manufacturing Company. 425 East Fourth Street, Chester, Pa.

Burt, A. Moody, Southern manager, John Campbell & Company. P. O. Box 1213, Charlotte, N. C.

Clark, Elizabeth A., superintendent, finishing and dyeing, Scranton Lace Company. 1772 Sanderson Avenue., Scranton, Pa.

Cowburn, Ralph, superintendent of finishing, Marlboro Cotton Mills, McCall, S. C. Box 302, McCall, S. C.

Hager, Herman E., manager, technical department. Grasselli Dyestuff Company, 117 Hudson Street, New York, N. Y.

Kershaw, James W., dyer, Standard Bleachery Company, Carlton Hill, N. J. 87 Westervelt Place, Passaic, N. J.

Landers, Bernard, chemical engineer. 170 Summer Street, Boston, Mass.

Mitchell, Burton F., superintendent, processing plant, Mt. Holly, N. C. Box 22, Mount Holly, N. C.

Mosby, Gordon, salesman and demonstrator, John Campbell & Co., New York, N. Y. 129 Marion Street, Brooklyn, N. Y.

Moss, Clarence E., Philadelphia manager and demonstrator, Portsmouth Dye & Chemical Company, Portsmouth, N. H. 2031 Walnut Street, Philadelphia, Pa.

Schroder, E. M. G., salesman, National Aniline & Chemical Company, Charlotte, N. C. Hotel Imperial, Atlanta, Ga.

Stafford, Henry A., textile chemist, Ewing-Thomas Converting Company, Chester, Pa. Ridley Park, Pa.

Willard, W. H., Southern manager, National Aniline & Chemical Company. P. O. Box 1202, Atlanta, Ga.

Junior

Bergman, Merriil M., chemist, United States Finishing Company, 58 College Street, Providence, R. I.

Glenn, A. T., dyer, Keystone Finishing Mills. Box 674, Burlington, N. C.

Hellmuth, Adam A., dyer, Hasco Dyeing Company, Weehawken, N. J. 301 Main Street, Union, N. J.

LaSalle, Joseph A., textile colorist, 516 Atlantic Avenue, Boston, Mass. 17 Hyde Park Avenue, Jamaica Plain.

Miller, Henry Grady, salesman, Grasselli Dyestuff Corporation, Charlotte, N. C. 2308 East Eighteenth Street, Chattanooga, Tenn.

Smith, Winfield F., chemist, Virginia Smelting Company, West Norfolk, Va. 229 Mt. Vernon Avenue, Portsmouth, Va.

Veevers, Arthur, foreman dyer, Glenlyon Yarn Dye Works, Phillipsdale, R. I. 87 Thomas Avenue, Pawtucket, R. I.

Volk, John, dyer, Aberfoyle Manufacturing Company, Chester, Pa. C-3 Evergreen Avenue, Folsom, Pa.

The matter of members who are delinquent in the payment of dues for the years 1924-1925 was presented for discussion by the treasurer, and it was decided that members who are in arrears for 1924 should be immediately dropped from the membership list, as they have had sufficient notice that this action would be taken. It was voted that those members, whose dues are still unpaid for 1925,

shall be notified by the Secretary, that unless the dues are paid by June 1st their membership will lapse, and that they will no longer receive the Proceedings until such time as the dues are paid in full.

The Council voted that Prof. Olney be granted $500 from the Research Fund in order that work may be started with the object of ascertaining what type of carding and spinning oils will yield the best results in the wool industry. This work will consist of a thorough review of the present literature upon the subject and will embody, beside the scientific investigation, practical trials under actual mill conditions.

Considerable discussion occurred relative to the publication of the 1925 Year Book. Several valuable suggestions have been made upon the questionnaires which were recently forwarded by the secretary, and many of these will be incorporated in the 1925 Year Book.

The list of dyestuffs appearing in the 1924 Year Book were submitted to the different dyestuff companies, in order that these lists may be revised and corrected for the coming Year Book. Practically all the companies have gone over their list of dyes and returned same.

Inasmuch as the prizes as offered for the past two years in the Year Book have met with so little response, it was decided to no longer offer such prizes, but to encourage the writing of papers upon such subjects as are of interest to the Association in general; such papers as proved acceptable to the Council could be published in the Proceedings and a proper monetary consideration awarded.

W. E. HADLEY, Secretary.

Applicants for Membership

Active

Cramer, Ralph S., plant manager, Cramer & King Company, Paterson, N. J. Sponsors: E. H. Killheffer and Giles Low.

Mobley, W. R., dyer, Newnan Cotton Mills, Newnan, Ga. Sponsors: N. R. Vieira and T. Taylor.

Watson, George W., salesman and demonstrator, Hazelhurst, Miss. Sponsors: N. R. Vieira and H. J. Horne.

Junior

Morris, Jr., J. W., dyestuff salesman and demonstrator, John Campbell & Co., Charlotte, N. C. Sponsors: A. M. Burt and C. P. Walker.

Changes of Address

Bailey, Lester H., 14 Sidney Street, Lowell, Mass.

Folsom, Herbert A., 8 Miller Avenue, Providence, R. I.

Herrmann, Albert E., 1224 Union Avenue, New York City.

Ilg, N. V., 192 Alabama Avenue, Providence, R. I.

Lawton, Heyward F., 160 Broad Street, Providence, R. I.

Mitchell, A. Sterling, 23 Maple Street, Newburgh, N. Y.

Schaeffer, Henri N. F., 38 South Angell Street, Providence, R. I.

Whelton, G. B., 177 Mt. Vernon Street, Lowell, Mass.

ASSOCIATION BADGES

The lapel button badge illustrated herewith is worn by members of the American Association of Textile Chemists and Colorists.

The three "rings" are enameled in red, yellow and blue, respectively, and the initials and border are brought out in gold. The general effect is exceedingly attractive.

Badges may be secured at $1.50 each by addressing the Secretary.

WALTER E. HADLEY,
5 Mountain Avenue,
Maplewood, N. J.

AMERICAN
DYESTUFF REPORTER

Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto.

LOUIS A. OLNEY
PROFESSOR OF CHEMISTRY AND DYEING, LOWELL TEXTILE SCHOOL
Directing Editor

CLAYTON HOAGLAND
Managing Editor

Published biweekly by
HOWES PUBLISHING CO., INC
90 William Street, New York City

A. P. HOWES, *President* E. S. PREDMORE, *Secretary*

Subscription price $5.00 per year; Canadian $5.50; foreign $6.00

Vol. XIV June 1, 1925 No. 9

WITH EMPHASIS ON THE GOOD SPOTS

APPROACHING the halfway point for the year, business finds it timely to review its activities during the past five months and to meditatively balance indications, both good and bad. "Everything in this world is good or bad by comparison with something else, the state of business being no exception," reminds one business authority.

The announcement that the first quarter of 1925 registered the largest volume of railway tonnage and the largest volume of payments through banks ever recorded in the corresponding period of any other year is unquestionable evidence that the optimism preached five months ago was not unfounded. Freight activity has continued beyond the first quarter, and from late reports we learn that freight loadings for the week ending May 16 totaled over 984,000 cars—the largest number loaded during any one week so far this year. The loadings for the first twenty weeks of this year have established a record higher than for any corresponding period in previous years.

Compared with the depression of a year ago, conditions in the textile industry at present are sound though not overprosperous. A recent report informs us that during April cotton spindling and consumption increased over any recent month. As a result of this expansion, there has been some more recent curtailment in cotton manufacture. The Boston wool market, affected to some extent by a sharp decline in raw wool prices, has lately been more active. The silk and rayon industries have nothing but encouraging news to report, the product of the latter especially attaining record volume.

Perhaps the most conspicuous note in business reports is the emphasis upon our expanding foreign trade. Industrial and market authorities now talk in terms of *world* trade, and in their perspective domestic business often appears only as part of this trade. The United States is more and more being considered as a country which ships things and to which things are shipped, rather than as a country which produces. Production is, of course, still the paramount factor, for unless we produced we could not ship; but some of its former prominence has been shifted to exportation and importation; an increasing degree of the attention we once gave to production is now centered upon the overseas distribution of the commodities produced.

The final figures for our foreign trade during the fiscal year 1925, which ends in thirty days, will be enormous. Exports and imports for this period, according to the Trade Record of the National City Bank, will reach over 8½ billion dollars, against 7¾ billions in 1924. The increase of more than two billion since 1922 is about equally divided between exports and imports. These foreign trade statistics are excellent indications of domestic manufacturing activity; they perforate pessimism and gloom, and support the opinions of sounder judgment.

We must remember that trade invariably has its low spots; that where one industry is breaking records another reflects only gloom. But prosperity continually shifts its center of gravity, and those who realize this fact try with optimism and encouragement to prevent the bad spots in business from being emphasized by the extreme pessimists. "Everything is good or bad by comparison with something else."

CHECKING UP CARELESS MAILING

Mailing statistics recently issued by the Post Office Department as part of an extensive campaign for better mailing reveal the surprising carelessness of those who use the mails—and that includes everyone. Do you know, says the announcement, that 21,000,000 letters went to the Dead Letter Office last year; that 803,000 parcels did likewise; that 100,000 letters go into the mail yearly in perfectly blank envelopes; that $55,000 in cash is removed annually from misdirected envelopes; that $12,000 in postage stamps is found in similar fashion; that $3,000,000 in checks, drafts and money orders never reach intended owners; that Uncle Sam collects $92,000 a year in postage for the return of mail sent to the Dead Letter Office; that it costs Uncle Sam $1,740,000 yearly to look up addresses on misdirected mail; that 200,000,000 letters are given this service, and that it costs one city alone $500 daily?

This vast sum could be saved and the Dead Letter Office abolished if each piece of mail carried a return address, and if each parcel were wrapped in stout paper and tied with strong cord.

Highs and Lows in a Busy Chemist's Life - Part IV

(*Continued from page 264*)

SOMETIMES dyers spring strange ideas, and the queer part of it is that quite often they are entirely correct.

One day a dyer write us a note about his last delivery of salt and ended his epistle, "It is not sodium chloride." Since it actually was salt of ordinary dyehouse quality, we concluded that his imagination must have become catalyzed or infected with an enzyme which promoted unusual activity.

We had the same suspicion when the same man reported that 56 per cent acetic acid which the purchasing department had just bought to save a little expense in handling, did not give the same results as the 28 per cent from the same manufacturer, which acid he had been using right along. Since he was dyeing cotton and wool unions with white silk effects, it seemed worth while to make a few careful tests, in spite of our skepticism, as he depended on the acid to keep the silk clean. We did find the merest trace more impurity in the 56 per cent than in the 28 per cent, and it consisted of sulphate, copper and iron. This did not seem sufficient to cause trouble, but laboratory tests showed that traces of these two metals had a serious effect on the colors in use, so we confirmed his opinion and he went back to 28 per cent acid. On further inquiry, the manufacturer stated that there was some difference in the methods of manufacture of the two strengths of acid and that the stronger contained a little more impurity, including traces of copper. It pays to be foxy and look into things a little. It we had declared offhand that there was no difference in the acid except the amount of water, and that the stronger acid was the better; and if then the management had learned of the difference from the manufacturer, it would have had one more evidence of the uselessness of chemists.

Until they have learned better by experience, many mill men think that a sample or two will tell all that it is necessary to know about a new mill process or anything else. I had a fine example of this and used it to teach a lesson.

A superintendent asked us to take a couple of samples of raw wool after scouring, before he made a change in the process. This was done, and then at his specification we took a couple of samples after he had modified the process. These were extracted for grease and we reported: before, 1.2 per cent; after, 0.6 per cent. He thought he had made quite an improvement, but we suggested that it might be well to take a few more tests. This was done with results all the way from 0.5 per cent to 1.5 per cent, so he was not so sure of his improvement after all. A similar set of tests should have been made over a little longer period before the change, but we did not dare suggest that at the time, because we knew he would object to waiting so long. Our chances of doing the thing right the next time were just so much better.

I do not know why raw wool scouring suggested Indigo but it did. Some kind of an expert was at the woolen mill one day a week to suggest improvements. He was reputed to receive fifty dollars for his day's pay, and since it took us nearly two weeks to earn that amount at pre-war rates, we were not overenthusiastic about his ideas. The water that went out from under the mill looked pretty blue from scouring Indigo dyed goods, so he got a sample from some part of the process and decided, from some crude sort of analysis, that it contained a lot of Indigo that ought to be recovered. The manager had heard of such schemes before, and knew that a lot of color might come from a little dye, so he asked the laboratory to check it up.

We took what seemed to be the most direct and simplest way, and determined the amount of Indigo in some of the goods before and after scouring and fulling. If any great amount of Indigo had been lost, or enough to pay for recovery, we certainly ought to miss it in testing the finished goods. The result, however, was such a small fraction of a per cent between the unfinished and finished pieces, that when figured out to pounds, it would not amount to anything in terms of dyeing costs, so that old ghost was laid again.

While it is not entirely a joy to conduct extractions in a modified Soxhlet with pyridine at the boil, we found that such methods of extractions and weighing the Indigo directly, according to the method of Green, et al., gave very good results after we had mastered some little tricks of technique.

Speaking of experts, few of them have ever crossed my path, but one other is certainly worthy of honorable mention. This gentleman had no specialty but modestly announced himself on his business card as "Expert in everything relating to the arts and sciences." It is scarcely necessary to mention where he came from, as Chicago is well known as the Windy City.

(*Part V will appear in an early issue.*)

THREE NEW DU PONT PRODUCTS

The dyestuffs department of E. I. du Pont de Nemours & Co. have just placed on the market three new products, Pontachrome Green G, Du Pont Silk Orange R Conc., and Pontamine Fast Orange EG

Pontachrome Green G takes the place of Pontachrome Green GLO, which will be discontinued. It is bluer than Pontachrome Green GLO, but very similar in properties as well as in strength. Pontachrome Green G can be applied as a straight color or can be used in combinations to produce browns, greens, or olives, and especially in mixtures to produce blacks that leave silk effects unstained.

Du Pont Silk Orange R Conc., a new acid dye, has been prepared especially for the silk trade. It is described as a very bright reddish orange, fast to water, moderate washing, perspiration, scrooping and hot pressing: the light fastness is satisfactory for silk.

This product, says the announcement, will find extensive use in the dyeing of skeins and pieces, both pure and

tin weighted, as a base for browns, tans and mode shades of every description, as it dyes very evenly and can be added to the boiling dye bath in any quantity without danger of unlevel results. The color can also be used for shading the silk in silk and half-silk hosiery, in a neutral bath.

Du Pont Silk Orange R Conc., like most acid colors, can be applied in a soap bath broken with acetic or mixed acid. A dyeing is best carried out just under the boil. It may also be dyed in a neutral bath at the boil with Glauber salt.

Pontamine Fast Orange EG is a bright, yellowish orange particularly described as surpassing other direct oranges in fastness to light; in addition it has better fastness than the average direct color to water, washing, perspiration and alkali. This color can be used for dyeing rawstock, yarn or pieces, and is particularly valuable for use in combination with other colors of similar properties for producing light browns, tans, grays and other fancy shades where the requirements for fastness must be above that offered by the average direct colors.

Another important feature of this color is the fact that the shade remains practically unchanged during diazotizing and developing, and will therefore find considerable use as a yellow component with diazotizable colors.

In dyeing union goods from a boiling bath the animal fibers are only slightly stained.

Pontamine Fast Orange EG is easily soluble and is said to dye very evenly so that it can be recommended for padding, as well as for use in the ordinary types of dyeing machines. This color can also be used in dyeing artificial silk and pure silk by the usual methods.

RECENT LITERATURE

Popular Textile Chemistry. By James A. Branegan. Kali Manufacturing Company, Philadelphia. 88 pages.

How many baffled "chem" students, lost in a bewildering maze of elements, reactions, properties, affinities and molecular aggregations, in their search for simply a broad, general knowledge of textile chemistry, have cried for a key that would lead them to light. Here in this pocket-size, plainly bound little booklet the complex technicalities of textile chemistry are reduced to simple facts intelligibly presented, so that the layman may easily grasp the essentials without first learning volumes of intricate and abstruse technology. The information included in this booklet represents nearly all that the general reader need know of textile chemistry; what has been omitted would represent a veritable library of dull, theoretical, ultra scientific abstraction.

The properties, the practical use and the manufacture of all the important chemicals employed in the dyehouse are described in a style remarkable for its conciseness and lucidity. The explanation is simplicity itself. The structure of complicated compounds is defined in unambiguous terms. The properties of, for instance, Glauber salt, and its manufacture are made clear with a few simple formulas and a few hundred words of lucid explanation. The formation of benzol and its function in the making of aniline oil are as easily understood as the composition of water. The manufacture of Methylene Blue appears no more intricate than its application on cotton. When a catalyst is referred to we are told what a catalyst is; atoms and molecules become as familiar as ounces and pounds. We are led directly from a brief description of the chemical and its use to a simple elucidation of its manufacture, by a series of facts logically arranged to form an elementary lesson in chemistry; and when we have with little effort digested several of these lessons we possess a definite conception of the complex science of textile chemistry, on which we easily "hook" the knowledge we derive from succeeding lessons.

Mr. Branegan, the author, is well equipped by technical education and practical manufacturing experience to write such a treatise. He deserves generous commendation for having presented the subject in a form available to everyone interested. Copies of "Popular Textile Chemistry" may be obtained upon request to the Kali Manufacturing Company, 1410 N. Front Street, Philadelphia, Pa.

* * * *

Artificial Silk. Tariff Information Survey. United States Tariff Commission. 103 pages. Price 15 cents.

This Tariff Commission Survey comprises general technical and industrial information covering domestic and foreign production and imports of all types of artificial silk. Descriptions, properties, forms, sizes and grades of the different varieties and their uses in industry are given, together with considerable information regarding production in this country and European producing countries. The history and importance of the industry, raw materials, process of manufacture, labor, organization and distribution, production, consumption, exports and imports are concisely treated and the whole supplemented with comprehensive statistical tables. One chapter deals with the production of articles made of artificial silk. This booklet is to the artificial silk industry what the annual Census of Dyes is to the dyestuff industry.

* * * *

Technology of Cotton Machinery: Part I—Calculation of Pickers. By A. A. Mercier. Department of Commerce, Bureau of Standards. 30 pages. Illustrated.

This booklet gives the results of a study that was made of the calculations on cotton pickers which may be applied to similar machines in the industry or to like machinery used in experimental work.

Dyestuff Tables

A List of the Principal American-Made Colors with Their Properties and Fastness Characteristics

[NOTE: The publishers of The REPORTER have secured more or less complete data in regard to many of the dyestuffs which are at the present time being manufactured in the United States. As the following material has been brought together from various sources, they realize that errors are quite likely to appear, and it is earnestly requested that any readers who find errors or who are able to give additional information will communicate with the publishers in order that this material may be made as correct, complete and up to date as possible. These tables will appear serially until all colors upon which we have data shall have been covered. The publication of this data was begun in the issue of March 10, 1924.]

OXAMINE GREEN B

(Schultz No. 474)

COMPOSITION: Trisazo.

SPECIALLY SUITABLE FOR: Cotton, cotton-wool and cotton-silk unions.

USUAL METHOD OF DYEING: With salt at the boil.

SHADE: Dull bluish shade of green.

SHADE BY GASLIGHT: Greener and brighter.

SOLUBILITY: Very good.

LEVEL: Dyes level.

EXHAUSTS: Fairly well.

FASTNESS TO:

Acid: Fairly fast against acetic acid.
Alkali: Fast against ammonia; much bluer with soda.
Chlorine: Very moderate.
Cross-Dyeing: Will not stand cross-dyeing.
Ironing: Shade goes temporarily bluer; bleeds when ironed wet.
Light: Average for Direct Cotton color.
Perspiration: Very moderate.
Rubbing: Fast.
Steaming: On cotton-wool unions it goes yellower at 14 pounds' pressure.
Sulphur: Fast.
Washing: Average for direct cotton color.

SENSITIVE TO METALS, LIME: Copper makes the shade very dull and flat.

MACHINE DYEING: Suitable.

OTHER PROPERTIES: Dyes cold, but very weak.

DYED BY OTHER METHODS: After chromed and coppered, no faster.

ON UNIONS: Cotton-wool union: Both fibers about equal; wool a little dull. Cotton-silk unions: Both fibers about equal.

ON OTHER MATERIALS: Silk: Dyed in a curdled soap bath with acetic acid. The fastness to washing is moderate, while the fastness to water is fairly good. Paper: Used on rag or cellulose unsized.

PRINTING: On cotton, suitable.

DISCHARGING: Hydrosulphite, fairly white. Zinc dust, fairly white. Tin, a yellowish discharge.

COMPETING PRODUCTS: Made in the United States by American Aniline Products, Inc., under name of Amanil Green 2G; Amalgamated Dyestuff & Chemical Company (Selling Agents, John Campbell & Co.), under name of Amidine Green Supra B; Central Dyestuff & Chemical Company (Selling Agents, H. A. Metz & Co.), under name of Diamine Green B; Newport Chemical Works, under name of Direct Green B; Calco Chemical Company, under name of Direct Green BY; National Aniline & Chemical Company, under name of Erie Green MT; Cincinnati Chemical Works, under name of Oxamine Green B; E. I. du Pont de Nemours & Co., under name of Pontamine Green BX; Commonwealth Color & Chemical Company, under name of Trianol Direct Green B; Palatine Aniline & Chemical Corporation (Selling Agents, F. E. Atteaux & Co.), under name of Pacco Green B.

OXAMINE GREEN G

(Schultz No. 475)

COMPOSITION: Trisazo.

SPECIALLY SUITABLE FOR: Cotton.

USUAL METHOD OF DYEING: With salt at the boil.

SHADE: Yellower than S-474.

SHADE BY GASLIGHT: No change.

SOLUBILITY: Not as good as S-474.

LEVEL: Good; better than S-474.

EXHAUSTS: Better than S-474.

FASTNESS TO:

Acid: Fair; same as S-474.
Alkali: Better than S-474.
Chlorine: Very moderate.
Cross-Dyeing: Will not stand cross-dyeing.
Ironing: Temporarily bluer.
Light: Average for direct cotton colors.
Rubbing: Good.
Sulphur: Fast.
Washing: Average for direct cotton colors.

MACHINE DYEING: Suitable.

OTHER PROPERTIES: Dyes cold, same as S-474. Suitable for dyeing cops in machines.

DYED BY OTHER METHODS: After chromed and coppered, no faster.

ON UNIONS: Cotton-silk unions: Both fibers about equal. Cotton-wool unions: Both fibers about equal. Dyed cold, the wool is scarcely tinted.

ON OTHER MATERIALS: Paper: Suitable for blotting paper.

PRINTING: On cotton, suitable.

DISCHARGING: Hydrosulphite and zinc, fairly white. Tin, yellowish.

COMPETING PRODUCTS: Made in the United States by American Aniline Products, Inc., under name of Amanil Green G; Amalgamated Dyestuff & Chemical Works (Selling Agents, John Campbell & Co.), under name of Amidine Green GX; Noil Chemical & Color Works, under name of Direct Green G; Newport Chemical Works, under name of Direct Green MTL; Cincinnati Chemical Works, under name of Oxamine Green G; E. I. du Pont de Nemours & Co., under name of Pontamine Green GX; Commonwealth Color & Chemical Company, under name of Trianol Direct Green G.

ACID GREEN B

(Schultz No. 502)

COMPOSITION: Triphenylmethane.

SPECIALLY SUITABLE FOR: Wool.

USUAL METHOD OF DYEING: With Glauber salt and sulphuric acid.

SHADE: Somewhat clearer than S-504.

SHADE BY GASLIGHT: No change.

SOLUBILITY: Good.

LEVEL: Excels S-504.

EXHAUSTS: Not completely.

FASTNESS TO:
- **Acid:** Fast.
- **Alkali:** Slight.
- **Fulling:** Fair.
- **Ironing:** Fast.
- **Light:** Equals S-504.
- **Perspiration:** Fast.
- **Rubbing:** Fast.
- **Steaming:** Fast.
- **Sulphur:** Slight; turns lighter.
- **Washing:** Slight.

ON UNIONS: Suitable for cotton-wool unions, as it goes on wool fairly well in a neutral bath.

ON OTHER MATERIALS: Silk: Suitable dyed in a bath of boiled-off liquor broken with acetic acid.

PRINTING: Can be printed on wool with acid.

COMPETING PRODUCTS: Made in the United States by Newport Chemical Works, under names of Acid Green B and Acid Green GB; Chemical Company of America, under name of Acid Green G; National Aniline & Chemical Company, under name of Acid Green L; E. I. du Pont de Nemours & Co., under names of Pontacyl Green B and Pontacyl Green BL.

BRILLIANT GREEN B

(Schultz No. 499)

COMPOSITION: Triphenylmethane.

SPECIALLY SUITABLE FOR: Cotton.

USUAL METHOD OF DYEING: On tannin mordant.

SHADE: Bright green, somewhat yellower than S-495.

FASTNESS TO:
- **Acid:** Fast to organic acid; changes shade with mineral acids.
- **Alkali:** Very slight.
- **Chlorine:** Slight.
- **Ironing:** Fast.
- **Light:** Slight.
- **Rubbing:** Crocks.
- **Washing:** Fair topped with tannin.

DYED BY OTHER METHODS: Used for topping substantives.

ON OTHER MATERIALS: On silk: Dyed with boiled-off liquor, broken with acetic acid. Start at 130 deg. Fahr. and raise slowly to 180 to 190 deg. Dye at this temperature for one hour. Fairly fast to washing. Fast to perspiration and does not crock on this fiber. Light fastness same as on wool.

COMPETING PRODUCTS: Made in the United States by Kerin Manufacturing Company, under name of Brilliant Green; Newport Chemical Works, Inc., under name of Brilliant Green Crystals; National Aniline & Chemical Company, under name of Brilliant Green B Crystals.

MALACHITE GREEN

(Schultz No. 495)

COMPOSITION: Triphenylmethane.

SPECIALLY SUITABLE FOR: Cotton.

USUAL METHOD OF DYEING: Tannin mordant. For printing, use the oxalate instead of the double zinc salt.

SOLUBILITY: May be precipitated by hard water.

FASTNESS TO:
- **Acid:** Good to organic acids; slight against mineral acids.
- **Alkali:** Very slight.
- **Chlorine:** Slight.
- **Cross-Dyeing:** Fair topped with tannin.
- **Fulling:** Slight.
- **Ironing:** Fast.
- **Light:** Not fast.
- **Perspiration:** Fast.
- **Rubbing:** Crocks.
- **Washing:** Fair topped with tannin.

ON OTHER MATERIALS: On wool: With acetic acid; fast to organic acids; fairly fast to washing and alkali; not fast to fulling or light. On silk: With boiled-off liquor and acetic: fast to acid; fair to washing and light. On paper: Best on sized or unsized cellulose; shaded with Auramine or Methyl Violet.

PRINTING: Can be printed on silk with tannin.

(Continued on page 380)

Practical Hints on the Production of Bright Colors on Textile Fabrics

Part XIII

Production of Extra Brilliant Effects—Operation of the Plant—Advantages—A Plant on Two Landings —Its Operation and Advantages

By RAFFAELE SANSONE

SO far the dyer could only carry out the brightening of cotton fabrics dyed with direct colors up to a certain point, because of the impossibility of combining with the color lake more than a certain quantity of the basic color. There is no doubt, however, that by drying the material after the usual topping operations it would be possible, by treating it again with the same basic color, to increase the quantity of this absorbed by the material considerably, producing brighter effects which could be varied by treating during both topping operations with different dyestuffs.

A plant that would be useful for obtaining similar results could be constructed on the principle indicated in Fig. 3.

This shows four ordinary jiggers (A, B, C, D), the first of which is intended for dyeing with direct colors to form the ground shade, while the jiggers B and C are for two baths of basic color, carefully chosen for the topping operations, and the last jigger, D, is for after-tanning operations or for treating with another batch of suitable direct color, should this be required. The material is dried directly after such a treatment or after a slight rinsing.

Such jiggers are supplied with two external batching beams, three internal guiding rollers and a steam coil; in the cases, however, only of jiggers A and D. Cold water can be run in them at any time from suitably placed taps for performing rinsing operations. The batching shafts are driven by bevel wheels worked from an independent mechanism driven in each case by a small electric motor, so that all jiggers can be worked together or singly whenever required.

Between jiggers B, C and D are placed two separate series of vertical drying drums (G and H), joined at the top by transversal bars (F). On the bottom of such series two pairs of beams of cloth (I and L) can be entered and the same number of pairs of beams charged with the dry cloth (J and U) can be removed from the rear.

Operation of the Plant

Work on the plant described above can be performed in many ways in accordance with the requirements that may arise from time to time. The procedure would be as follows: The dyers enter on the jigger indicated by A a roll of cotton cloth that has just been boiled out and rinsed to free it of all alkali, fixing its ends to the batching rollers after passing it over the three guiding rollers in the dyeing vat; run into this vat the dye bath containing the direct dyestuff, conducting the treatment in the usual way. After dyeing, they run off the bath, rinse the material thoroughly and bring it on jigger B, starting the treatment of a fresh lot of material on jigger A.

On jigger B they enter the dyed cotton cloth with the usual precautions and treat it with a cold or lukewarm bath containing a portion of the basic color, adding the rest in several lots during the dyeing process. When the topping has thus been completed, the goods are simply rolled on a wooden beam without rinsing and are carried before cylinder G for the drying operations. Here

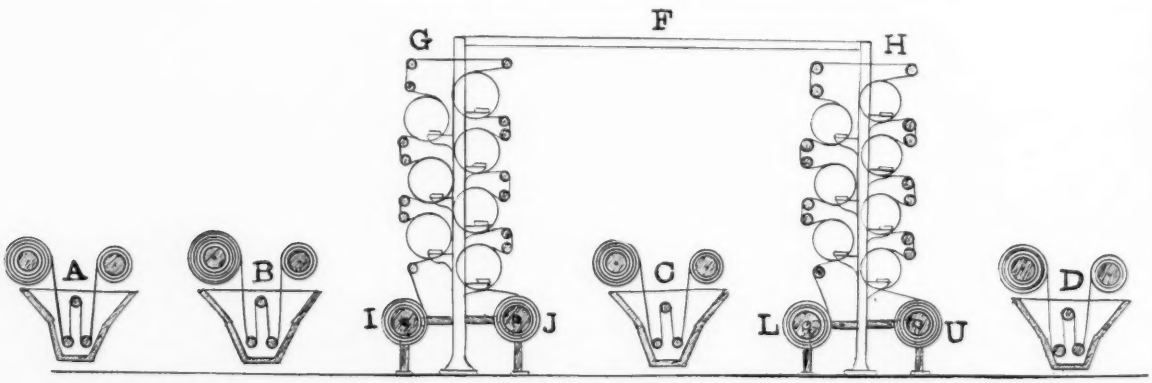


Fig. 3

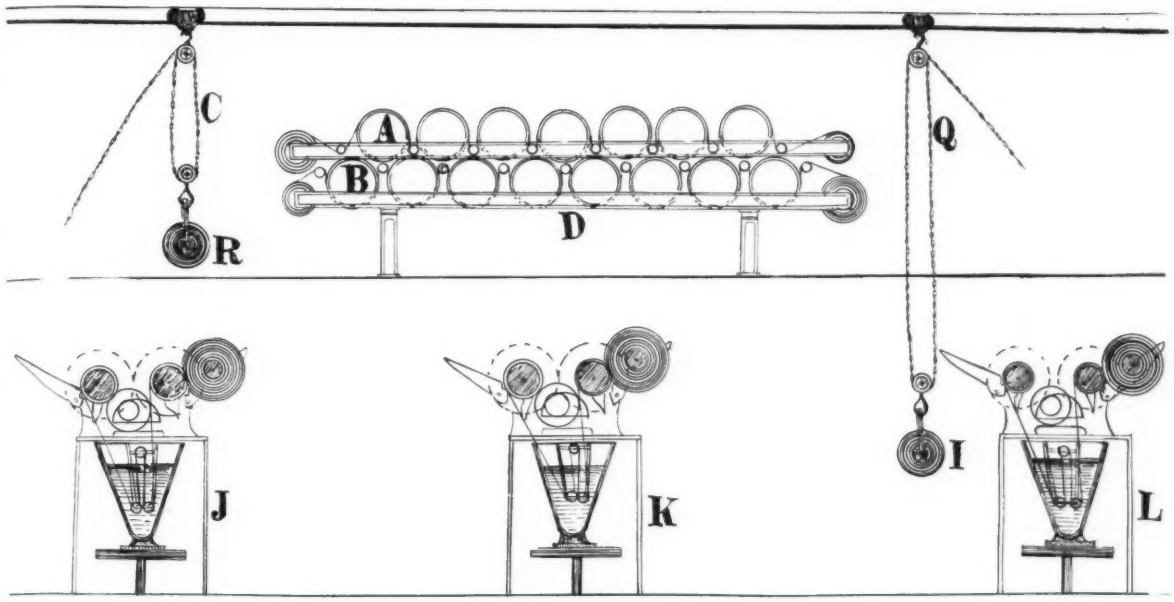


FIG. 4

they are entered, being rolled later to the back of the drying plant on another wooden beam, ready for removal to jigger C.

On this jigger the cotton cloth is entered in the usual way and is topped with the second bath of the basic color, being then carried, also without rinsing, to the cylinders H, to be dried as in the first case and delivered directly to the packing department, or after-tanned or otherwise treated on jigger D to fix the dyestuff only mechanically deposited on the material and render faster that forming a lake with the direct color, after which the cotton cloth is rinsed on the same machine and carried again before the drying cylinders (either G or H) for a third drying. In this way extra bright shades are produced having a fair fastness to washing and light, quite sufficient for satisfying many purposes. In some cases the drying following the second topping can be avoided by bringing the cotton cloth directly from jigger C to jigger D.

ADVANTAGES OF THE PLANT

Some of the advantages of the above plant can be indicated as follows:

1. One lot of cloth can be dyed in substantive colors and topped with basic colors.
2. Two lots of cloth can be dyed with direct colors and topped simultaneously under convenient conditions.
3. One lot of cloth can be dyed with substantive colors and topped twice.
4. One lot of cloth can be dyed with direct colors, topped twice and after tanned or treated with a second bath of a direct color.
5. All work on the plant can be conducted continuously or at intervals in accordance with the requirements of the works.
6. The dyer has the goods he is treating continually in sight and can correct in time any difference of shade.
7. The space occupied by the plant is not large, nor does it necessitate any great change for many mills.

A PLANT ON TWO LANDINGS

Another plant that would offer special advantages for the dyeing of substantive coloring matters and their topping with basic dyestuffs could be constructed on the principle indicated in Fig. 4.

This shows three jiggers (J, K, L) of special type placed on a lower landing. The upper frame of the jiggers is joined to a small cage supporting three guide rollers for the cloth to be treated, while the dye vats can be lowered for replacement with others containing fresh baths and for cleaning the upper portion of the jiggers. The jiggers are supplied with the usual batching rollers, the movement of which is reversed at the end of each piece, and are heated when necessary by a copper coil and have a cold-water tap.

On an upper story is placed a drying machine (D), with which two lots of cotton cloth can be dried simultaneously and independently on an upper and lower series of drums (A and B) heated by steam. Above these is placed an iron rail fixed to the ceiling and containing two hand cranes (C and Q) through which two rolls of cotton cloth (R and I) can be brought from the boiling-out and rinsing department, or from elsewhere in the mill, and lowered, through a hole in the flooring of the upper landing, to a place in front of the jiggers (J, K, L).

OPERATION OF THE PLANT

The operation of the above plant could be performed as follows: After making the necessary arrangements in

the boiling-out and rinsing department to receive several rolls of cloth wound on wooden shafts in the wet condition, the foreman-dyer has these carried two by two to the department where he is to carry out the dyeing. Three of such rolls are entered on the jiggers J, K, L, to which the same number of vats are then fitted with the dye baths containing direct colors and the necessary quantity of salt and some carbonate of soda, if necessary.

When this has been accomplished, the jiggers are started by switching on the electric current to small motors coupled directly to a main shaft on the jiggers, turning on steam in special heating coils that are now lowered. The dyer then passes from jigger to jigger, observing the shade produced and stopping the plant if necessary to lower the dye vat and take a sample for matching. Should the shade be off, the dyer has simply to keep down the dye vat and stop the dyeing operations, giving the material an immediate rinsing with water in another vat that is raised at once below the guide rollers and which has a discharge tube, all liquid of which falls into a lower collection through delivering directly to the waste water main of the mill.

When dyeing is completed, all dye vats are lowered and delivered to the department kept for the storage of old baths and the preparation of new baths, raising below the three lots of cotton cloth vats containing clean rinsing water, in which the material is given several ends, while entering more water at the top of the vats from the taps already indicated. In this way all mechanically fixed dyestuff is eliminated, and the material is prepared ready for the topping operations.

Topping is performed by raising below the frames of the jiggers three other vats containing solutions of the requisite basic dyestuffs, avoiding in this instance the use of the heating coils. In such baths the cotton cloth is then given the necessary passages to produce the required brightening and shading, withdrawing the vats again after this and replacing them with others containing water for the rinsing operations. These have a special outlet tube at the bottom, by which the water circulating through is delivered at once into a collection trough leading directly to the waste water main of the mill.

When the rinsing has been completed, the vats are again lowered and the cloth is passed to the wooden beams from which it was previously taken, and with the cranes C and Q two of the rolls of cloth are entered on the drying plant, while the third is placed on a stand before the plant awaiting treatment. In the meanwhile, the dyers lower three further rolls in the jiggers, which have been thoroughly cleaned; these undergo three further dyeing and topping operations.

Advantages of the Plant

1. Each jigger can be employed for dyeing with the direct colors, rinsing and topping once or twice if necessary.

2. A jigger can be used for dyeing with the direct colors, a second jigger only to the rinsing of the material and a third only to the topping operations.

3. The cotton fabrics can be dyed and after-tanned or after-dyed in direct colors, to fix the basic color more strongly.

4. The production of the plant is large and can be rendered quite continuous by adopting the necessary arrangements.

5. The jiggers can be used for soaping, chroming, diazotizing, etc.

6. The dyeing can be performed with the direct colors, eliminating the additions of salt, by dyeing a first time in these, drying and redyeing when medium and dark shades are to be produced.

7. By careful organization, one dyer can treat three lots of cloth at once, having assistants for carrying the rolls of cloth and lowering them, and for leading the vats to and from the plant.

(Part XIV will appear in an early issue)

MARKET FOR DYES IN BOLIVIA

No dyes are produced in Bolivia, according to a report from Consul D. C. McDonough, La Paz. The most important consuming industry is that of weaving woolens. There are only two small factories but a great deal of woolen cloth is woven by hand by the Indians. The local dyeing establishments use only small quantities of dyes. Some dyes are used by the tanneries and shoe factories, since there is quite a demand for colored leather for use in making the characteristic tall shoes or boots used by the chola or mestizo women. There are practically no large consumers of dyes, and purchases by users are made in very small quantities. Wholesalers carry rather large stocks while retailers have generally very small shops and carry only small stocks.

Imports of dyes from Germany have been over 50 per cent of the total during the last four years. German dyes are well adapted to local distribution methods. They are put up in 2 to 8 ounce containers, covered with smooth paper of the same color as the dye, and having a label in very bright colors showing attractive pictures with the Bolivian national colors as well as the weight and place of origin in the Spanish language. The wholesalers sell largely to very small Indian or half-breed retailers who display the dyes so that the Indian customer, who buys in very small quantities, can select the color he wants.

Imports of dyes, including natural Indigo, into Bolivia during 1923 totaled 127,256 kilos, valued at $87,577, of which 53,235 kilos, valued at $49,944 were from Germany; 17,658 kilos, valued at $5,713 from Great Britain, and 8,730 kilos, valued at $5,058, from the United States. A total of 70,925 kilos, valued at $97,940, was imported in 1921, and 55,617 kilos, valued at $67,296 in 1922.

John W. Bullard has taken the position as overseer of dyeing for the Virginia Woolen Company, Winchester, Va. Mr. Bullard comes from Columbia City, Ind.

Technical Notes from Foreign Sources

Action of Heat on Cotton Cellulose

Samples of air-dry and glycerine-impregnated bleached cotton yarn having a copper number of 0.4 had, after being heated for 1,886 hours at a temperature of 90 deg. Cent. in open, sealed and evacuated tubes, copper numbers of 2.1, 1.3 and 0.8 respectively, and of 1.3, 1.0 and 0.8. The tensile strengths of the yarns were 45 per cent of the original; that is, 57 per cent, 63 per cent and 33 per cent, 80 per cent and 88 per cent respectively. After a similar heating for a period of 1,914 hours, air-dry and glycerine-impregnated gray cotton yarns having a copper number of 0.5 had copper numbers 1.8, 1.45, 1.0 and 1.3, 1.25 and 1.68, and tensile strengths of 48 per cent, 64 per cent and 26 per cent, 48 per cent, and 72 per cent respectively.

Cotton yarns which have been mercerized by means of caustic soda or concentrated solution of nitric acid are more susceptible (as measured by increase of copper number) than non-mercerized yarn to the action of prolonged heating and sunlight. Except in the case of mercerized yarns, the copper numbers of the heated cotton are low in comparison with the decrease in tensile strength. Discoloration of cotton by means of heat is not a reliable criterion of its deterioration. The formation of an empyreumatic odor and a volatile acid occurred when cotton was heated in sealed tubes, although the amount of oxygen consumed was small. Air-dry bleached cotton is scorched by contact with iron at a temperature of 300 deg. Cent., mercerized bleached cotton being more susceptible than bleached cotton. (For further details see Journal of the Society of Dyers and Colourists, 1925, volume 41, page 43 to 47.)

Use of Soaps in the Textile Industry

An interesting article has appeared on the use of soap in the textile industry in the French journal Rev. des Matieres Colorantes, 1925, pages 92 and 93.

It is stated therein that a stearine soap is employed for the purpose of giving cotton the characteristic rustling sound possessed by silken fabrics. To effect this the cotton thread or fabric is passed through a solution of the soap, and then through an acid bath which decomposes the stearate. Stearine acid is thus fixed on the cotton fiber. The decomposition of the soap can be effected by means of a calcium salt or a magnesium salt, which then yields insoluble soaps.

The waterproofing of the textile fiber is based on the same principle. The cloth is treated with a solution of a soap that is made from a liquid oil or olein, and then is treated with a solution of aluminum acetate, which results in the deposition of an insoluble waterproofing alumina soap.

The composition of sizing mixtures varies according to the textile that is going to be sized, the machines employed in the sizing process, the mode of drying and the like. Below are given a number of characteristic formulas for sizing various fabrics:

Warp fabrics are sized with a mixture of 15 parts of kaolin, 10 parts of water and 3 parts of palm oil. The mixture is brought up to the boiling point, and then cooled while being constantly agitated. To this mixture there are then added 5 parts of a 35 deg. Be. solution of chloride of zinc and the same amount of a 35 deg. Be. solution of chloride of magnesia. The entire mass is then diluted with 12 parts of starch and 20 parts of water, and finally 5 parts of glucose is added. The entire composition is then vigorously agitated, while the temperature is raised to the boiling point and maintained there for a period of twenty minutes.

A sizing composition for white linen goods is made in the following manner: Ten parts of fine flour, 3 parts of starch, 10 parts of kaolin, 1.6 parts of white soap, 0.6 part of white wax, 0.4 part of tallow, 0.06 part of ultramarine and 8 parts of 28 deg. Be. glycerine are mixed together. Then enough water is added to make the mixture up to 180 parts and the sizing composition is ready for use.

A size which is used on black linings is composed as follows: Ten parts of dextrine, 10 parts of water, 1 part of tallow and 5 parts of wax are mixed together and brought to the boiling temperature. The fatty substances float on top of the solution as soon as the agitation is stopped.

At this point the steam is stopped and 50 parts of water is added. In another receptacle there is then prepared a mixture of 9 parts of starch in 10 parts of water, and this mixture is introduced into the first. The entire mass is then brought up to the boiling temperature and maintained there for twenty minutes, and then the following composition is added: Four parts of logwood extract, 0.3 part of sulphate of copper, 0.2 part of potassium chromate and 200 parts of water.

A sizing composition which can be used with good results on linen and imitation linen fabrics is composed as follows: Five parts of kaolin, 7.5 parts of sulphate of lead, 4.5 parts of whiting, 2.5 parts of tallow, wax or stearine and 7.5 parts of wheat starch. Twelve parts of potato starch are also added.

Hydrolysis of Starch by Means of Oxygenated Water

It is a fact that a great variety of substances are used in the preparation of sizing compositions, but in

spite of the complexity of these compositions it is really a very simple matter to line up the various substances which are capable of producing desirable effects in the fabric without destroying or injuring its other valuable properties. The best results have always been obtained with compositions which contain the minimum amount of solids. Glue, gelatine and albumin may be employed in making good sizes, but these substances are comparatively expensive and cannot always be used because of their color.

It is known that when starch is decomposed—that is, hydrolyzed—there is obtained a mixture of dextrine and sugar, which are soluble products. If the hydrolysis of the starch is only partial, then a substance is obtained which is soluble in the hot but which congeals in the cold. Under the proper conditions a white dextrine is obtained which is soluble in the cold and which contains only a small proportion of sugar.

A great many substances are known which possess the power of hydrolyzing amalaceous matter, but it is a very difficult matter to select the right reagent and in addition thereto to regulate the conditions under which it acts so as to obtain a product with the requisite properties.

In a large Russian textile plant the hydrolysis of the starch is carried out without the use of a catalyst by prolonged boiling with direct steam. Thus 40 kilograms of starch is mixed with the proper quantity of water in a large kettle, and then the mixture is brought to the boiling temperature and maintained at that point until liquefaction of the starch is complete. At the end of the process the mass becomes fluid and limpid, like oil. This concentrated starch solution contains approximately 13.5 per cent of starch, and it is diluted according to need and used. In the condition in which it is obtained it is easy to thicken the size by the addition of a soap solution which gives a neutral reaction with phenolphthalein.

While the process has good results, nevertheless the author thought it more advisable to be able to carry out the process with the aid of a catalyst, and it was not always possible for the same good results to be obtained at all times in the plant. He found that the best effects were obtained with the aid of oxygenated water, the action of which is very regular. The use of oxygenated water also had the effect of reducing the time of the operation to about twenty minutes.

For every 40 kilograms of starch there was used 600 c.c. of an oxygenated water at 5 volumes. If the starch is neutral it may be used at once. If the water, on the other hand, contains a little mineral acid it is necessary to add a sufficient quantity of acetate of soda to the starch. The oxygenated water may be prepared by introducing small quantities of sodium peroxide into a liter of ice-cold water containing 80 grams of sulphuric acid of 82 deg. Be. and 10 grams of alcohol. In all, about 50 grams of peroxide of sodium is employed. The alcohol serves for the preservation of the solution. This water is about a 5-volume concentration and is used directly in the process.

It is also possible to employ sodium peroxide directly for the boiling of the starch in place of the oxygenated water. About 30 grams per kettle of 300 liters capacity is used. After the boiling is completed, the starch is neutralized with the aid of acetic acid. The starch solution made in this manner may be preserved for a long time in the hot without losing its strength, which is not the case with starches prepared with the aid of malt.

The author has had the occasion to compare the action of sizing that has been prepared with the aid of oxygenated water and that prepared with the aid of malt. It was found that the malt diminishes the yield to a marked degree. In other words, when 100 pounds of starch treated with oxygenated water is employed, the same effects are produced as when 150 parts of a product prepared with the aid of malt is employed.

Furthermore, the cloth that has been sized with oxygenated starch size will offer greater resistance and will have more body under equal pressure conditions in spite of the smaller content of starch matters in the cloth. The homogeneity of the oxygenated starch size is perfect, and it can be directly mixed with direct coloring matters as well as with Geranine and Chrysophenine. It can also be mixed with ground ultramarine.

After the oxygenated starch is desiccated, it is soluble in cold water. The fluidity of the starch size thus made is considerable, with the result that it is readily absorbed by the textile fiber. Furthermore, it is a very economical size and the cost of the oxygenated water employed is small. On the other hand, this added cost is compensated by the reduction in the consumption of steam and time.

(For further details the reader is referred to Bulletin Soc. Ind. Mulhouse, 1924, page 558.)

Fast Colors on Cotton and Cotton Substitutes

In the manufacture of ladies' knitted and woven dress goods it is of particular importance that the colors are fast not only to light but to washing as well. The regulation of the temperature is of great significance in the dyeing with colors that are fast to water. When basic dyestuffs are employed for this purpose, it is advisable to add a little acetic acid to the color bath. Light shades produced with substantive dyestuffs develop better at lower temperatures, while the coloring matters of darker tone give good results only when the dyeing is conducted at the boiling temperature. Then, again, when the vat dyestuffs are employed a preliminary test should always be made to determine the best temperature at which to carry out the process.

A particularly important role is played by the preliminary treatment of the goods with soda or caustic lye. It was also found that the fastness of the sub-

stantive colors may be materially increased by the after-treatment with salts of chromium or copper.

Naphthol AS and LA are recommended in the dyeing of Bordeaux shades and for Red Primuline and Paranitraniline Red, 50 per cent of each. Catechu Brown R and RG, with after-treatment with potassium chromate or copper sulphate, will give fast brown shades. The sulphur colors give shades that are very fast to washing and to light, and various shades, such as red and blue violet, heliotrope, lemon yellow, cherry red and the like, can be obtained with them. Here, again, the fastness of the colors is enhanced by after-treatment with the aid of chromium and copper salts plus a little formic acid. In the case of half-woolen fabrics it is necessary to protect the wool by the addition of protecol against the action of sodium sulphide. Blue, and particularly light blue, shades are best obtained with the aid of Indanthrene coloring matters. (Text. Markt., 1924, No. 25.)

DYEING ACETATE SILK

(Continued from page 352)

be applied to acetate silk superficially from a fine suspension in water or it may be dyed to deep blue shades from the regular leuco-indigo vat containing glue and a small quantity of hydrosulphite and ammonia, similar to Method No. 43. Indigosol, the new soluble form of indigo, does not appear to have quite as much affinity for acetate silk as leuco-indigo applied by the above method.

Most of the Indanthrene vat dyes of the older classification do not appear to be particularly applicable to acetate silk by the regular hydrosulphite vat methods on account of the high alkalinity of the dye bath required to hold them in solution. However, some of them have a rather limited application to the cotton of acetate silk-cotton unions, but extreme care must be exercised to avoid saponification of even the Lustron variety of acetate silk. Some of them could possibly be applied to the acetate silk by the saponification process which will be discussed later. Indanthrene Bordeaux B, Algol Rose R, Algol Scarlet G, Algol Yellow WG and Algol Violet B are absorbed by acetate silk from aqueous suspensions and have good fastness. Certain Anthrene dyes are also absorbed by Celanese when applied by the dispersol process, as will be discussed later.

According to British Patent No. 214,112, May 28, 1923, to W. Kilby and Morton Sundour Fabrics, acetate silk may be dyed by means of the alkaline hydrosulphite vat (see the application of vat dyes) with amino- or nitro-derivatives of anthraquinone or their alkyl or halogen derivatives; for instance, 1- or 2-amino-, 1, 5-dinitro-, 1, 5-diamino-, 1-amino-2-methyl-, 1-methylamino-, 1-amino-2, 4-dibromo-, 1-amino-5-chloro, or 1-nitro-4-chloro derivatives of anthraquinone, give orange, yellow, red-violet, and pink shades, and these shades may be diazotized and developed with *B*-naphthol.

Method No. 48: Aniline Black on Acetate Silk.—Briggs states that the affinity of acetate silk for aromatic amines makes it especially adaptable for aniline black dyeing. The silk may be treated with aniline hydrochloride in dilute solution and then impregnated with strong aniline hydrochloride, chlorate and copper liquor. It is whizzed, hung up, and oxidized for 1 to 1.5 hours at 40 to 60 deg. Cent. (104 to 140 deg. Fahr.), after-treated with acid bichromate and shaded up.

Method No. 49: Black on Acetate Silk.—British Patent No. 194,840, January 5, 1922, to Clavel, covers the production of black shades on acetate silk by Aniline Black. The affinity of this fiber for amino-, imino- and acidylamino compounds is utilized by impregnating the fiber with Diphenyl Black Base (*p*-aminodiphenylamine) in the presence of acids, with or without protective colloids, and then oxidizing on the fiber. A stock solution is prepared containing 200 g. Diphenyl Black Base, 500 c.c. of 80 per cent acetic acid, and 500 c.c. of water. For 1 kg. of acetate silk, take 250 c.c. of the above stock solution, in 20 liters of water and 2 liters of silk boil-off liquor. The bath is heated to 50 deg. Cent. (122 deg. Fahr.) and the goods worked for one hour; 50 grams of sodium acetate are then added and the goods worked for another hour at 60 deg. Cent. (140 deg. Fahr.). They are rinsed and oxidized by the addition of three portions of 25 g. each of sodium perborate at intervals of 20 minutes, after which they are washed or brightened. The perborate may be replaced by hypochlorate or ammonium persulphate.

Another method covered by the same patent utilizes stock solutions (*A*) containing 200 g. Diphenyl Black Base, 550 c.c. of 50 per cent acetic acid and 250 c.c. of 50 per cent lactic acid in 1,250 c.c.; and (*B*) containing 125 g. of 30 deg. Be. (d. 1.26) aluminum chloride, 125 g. of 30 deg. Be. chromium chloride, 20 g. of 40 deg. Be. (d. 1.38) cupric chloride and 150 g. of sodium chlorate in each 1,250 c.c.; 750 c.c. each of *A* and *B* are mixed and diluted to 4.5 to 6.5 liters, and the acetate silk is steeped in this cold bath. After removal it is aged for an hour at 80 deg. Cent. (176 deg. Fahr.), washed, soaped at 50 to 60 deg. Cent. (122 to 140 deg. Fahr.), rinsed well and finally soured. Also see Method No. 53 under Solvent Methods.

Such natural dyes as Cochineal, Logwood and Catechu give deep shades on acetate silk and a "dry dyeing" method was at one time developed, using a benzene solution of the dyestuff, or an alcoholic solution of the dye in benzene. The azoic dyes are also used on acetate silk.

Method No. 50: Dyeing Acetate Silk with Ammonium Thiocyanate.—The ammonium thiocyanate method of dyeing is covered by British Patent No. 158,340, October 31, 1919, and United States Patent No. 1,398,357, November 29, 1921, to J. F. Briggs, C. W. Palmer and the British Cellulose Company. By this method the affinity of acetate silk is increased for basic, acid, substantive, vat and other dyestuffs. The thiocyanate may be applied before or during dyeing, but preferably the former. Five to twenty-five per cent solutions, at various temperatures, are applied for from two minutes to an hour or more

The examples given state that when acetate silk is treated for 15 minutes in a 25 per cent solution of ammonium thiocyanate and washed in cold water, it may then be dyed in a bath containing 0.5 g. of Dianol Fast Red K per 100 c.c. of water, at 20 deg. Cent. (68 deg. Fahr.). For acid and direct dyes only about a 15 per cent solution of thiocyanate is necessary. Another method is to dye the acetate silk for 15 minutes at 40 to 60 deg. Cent. (104 to 140 deg. Fahr.) in a dye bath containing 1 kilo of Naphthol Blueblack, 30 g. of Orange G and 24 kilos of ammonium thiocyanate per 100 liters. Vat dyes may be applied in a dye bath prepared with caustic soda and hydrosulphite. In the case of Durindone Red B, the prepared vat is diluted with an equal volume of 3 per cent thiocyanate solution and the acetate silk dyed at 20 deg. Cent. (68 deg. Fahr.).

(*Part VII will appear in an early issue*)

DYESTUFF TABLES

(*Continued from page* 373)

DISCHARGING: Chlorate discharge: White enough for colored effects. Glucose soda lye: White. Tin: Suitable for color discharge.

COMPETING PRODUCTS: Made in the United States by Kerin Manufacturing Company, under name of Malachite Green; Williamsburg Chemical Company, under name of Malachite Green Crystals; E. I. du Pont de Nemours & Co., under names of Victoria Green B and Victoria Green SC; National Aniline & Chemical Company, under names of Victoria Green WB Crystals and Victoria Green WB Powder.

DIRECT BROWN
(Schultz No. 487)

COMPOSITION: Tetrakisazo.

SPECIALLY SUITABLE FOR: Cotton yarn dyeing.

USUAL METHOD OF DYEING: With salt.

SHADE: Dull reddish brown.

SHADE BY GASLIGHT: Yellower.

SOLUBILITY: Good.

LEVEL: Dyes level.

FASTNESS TO:

Acid: Goes redder and duller.
Alkali: Moderate; goes yellower.
Chlorine: Destroyed.
Cross-Dyeing: Will not stand cross-dyeing.
Ironing: Temporarily yellower; shade returns on cooling.
Light: Moderate.
Rubbing: Crocks a little.
Steaming: Fast.
Washing: Moderate.
Water: Stains adjacent whites.

SENSITIVE TO METALS, LIME: Iron turns shade yellower. Copper: The shade is weaker.

ON UNIONS: Cotton and artificial silk combinations: The artificial silk is heavier even in cold baths.

ON OTHER MATERIALS: Silk: Dyed in neutral bath; not fast to water on this fiber.

DISCHARGING: Discharges white.

COMPETING PRODUCTS: Made in the United States by Essex Aniline Works (Selling Agents, Grasselli Dyestuff Corporation), under name of Direct Brown 2R; Newport Chemical Works, Inc., under name of Direct Brown RG.

TEXTILE COURSES FOR MILL MEN

Courses in yarn manufacturing, loom fixing, designing, fabric analysis and textile calculations will be offered during the summer school which will be held at the North Carolina State College from June 15th to July 24th.

The courses will be given in the Textile School, and the subjects will be arranged to cover as much ground as possible and in a practical manner. In this way a man who wishes can take any special work; for example, on a card, or in fancy weaving, loom fixing or designing such as leno. In this way he can specialize on any subject.

Special hours will be assigned for the study of each subject, but the full day will be spent in the Textile School applying the principles given in the classroom.

The work will be so arranged that a person can spend the whole or a part of the six weeks as he finds convenient and necessary.

POSITION WANTED

As bleacher or assistant superintendent in print works or finishing plant. Sixteen years' practical experience. A1 references. Address Box 300, American Dyestuff Reporter.

DYESTUFF SALESMAN

WANTED—An experienced, high-grade dyestuff salesman, with executive ability, for the handling of a Southern territory. Reply confidentially, giving age, experience, salary desired, etc. Address Box 301, American Dyestuff Reporter.

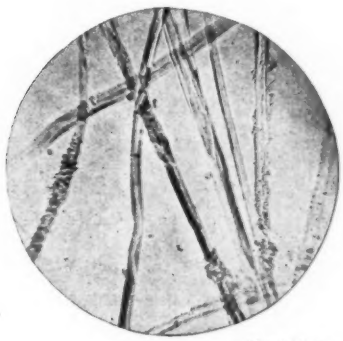
TEXTILE CHEMIST

Eleven years' experience in the application of color to all fibers, bleaching, printing, testing dyes and chemicals; desires position with progressive concern. Address replies to Box 302, American Dyestuff Reporter.

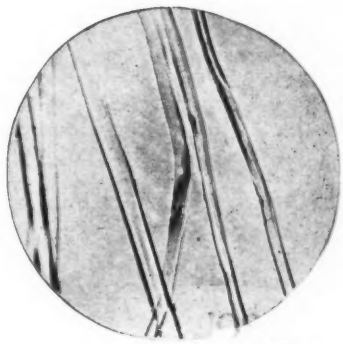
TEXTILE CHEMIST

A young man, 26, married, desires opportunity with reliable dyestuff concern. Has had ten years' experience in every phase of laboratory work, standardizing, matching, etc. Familiar with dyestuffs on all fibers. Excellent references. Address Box 303, American Dyestuff Reporter.

Unretouched photomicrographs of silk fibres after degumming in hard and soft water. Note the deposits of lime soap on the hard water processed fibres on the left.



Hard Water Processed



Soft Water Processed

It Pays to Study Your Water Supply

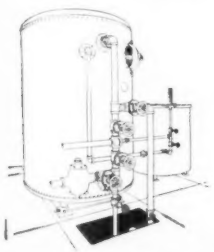
In the various processes throughout your mill, water is probably by far the biggest raw material you use—have you ever examined it for impurities and quality, as you examine other raw materials? It certainly would pay you to do so.

LOOK closely at the two photomicrographs above. On the right are clean silk fibres that were degummed in Permutit softened water—examine the almost transparent fibres and note how clean they are. Then look at the other photograph of similar fibres degummed in water containing a few grains of hardness per gallon, and see how the lime soap curds formed by hardness almost bury some of them. When such fibres are dyed and finished the product is necessarily of inferior quality, and very likely to be spotty, lusterless and altogether unsatisfactory.

The mill that sent us these two samples saved thousands of dollars by installing Permutit apparatus to properly condition their water supply. They cut down redyes to an almost negligible amount, and their rejections scarcely amount to anything now, although they used to cost a lot of money. In addition, the quantity of soap and supplies saved paid for the entire Permutit installation in about 18 months.

We are specialists in solving water problems. We make all types of apparatus for conditioning water, and our equipment is saving thousands of dollars annually for many textile mills by eliminating troubles and improving the quality of yarns and cloth.

Our booklet, "Reducing Textile Costs and Troubles," contains a lot of valuable information about textile water supplies. Let us send you a free copy. Write to-day —The Permutit Company, 440 Fourth Ave., New York.

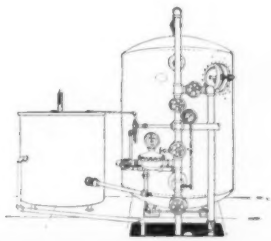


Permutit

(PER-MUTE-IT)

Water Softeners

Take all the hardness out of water



THE PERMUTIT COMPANY, 440 FOURTH AVE., NEW YORK

EDWARD C. FOSTER

274 WASHINGTON ST. PROVIDENCE, R. I.

IMPORTER AND
MANUFACTURERS' AGENT

Specializing in Colors Manufactured by

LEOPOLD CASSELLA & CO.

FRANKFURT o, M

DYESTUFFS

AZONINE COLORS
Used on Acetate Silk
Both Direct Dyeing and Developed Colors

Product Samples and Prices on Request

United States Color & Chemical Company, Inc.

93 Broad St. Boston, Mass.

New York Office: 25 Howard St.

FACTORIES:
NEW ENGLAND ANILINE WORKS, Inc.
Ashland, Mass.

GARFIELD ANILINE WORKS, Inc.
Garfield, N. J.

French Lick Springs Hotel

The All-Year Convention Site

French Lick Springs Hotel, accessibly located in the Cumberland foothills region of Southern Indiana is now more than ever the place for conventions with its new, 1500-seat convention auditorium, amply ventilated by outside windows on all four sides.

Healthful, natural spring waters of world-wide fame, two excellent 18-hole golf courses, horseback riding, tennis and hiking are among the attractions at French Lick. Rooms and meals are included in the rate. Before you leave home, you can tell, almost to a dollar, what your expenses will be. Write for illustrated booklet and details of convention facilities.

Address Convention Secretary
FRENCH LICK SPRINGS HOTEL COMPANY
French Lick, Indiana
"Home of Pluto Water"

WANTED

The word "wanted" never fails to attract attention. The words "for sale" have a similar power.

When a "wanted" and a "for sale" meet there is a transaction that is usually profitable to both.

The chemist or dyer looking for a position either inserts a one-inch classified advertisement in The Reporter or he carefully reads those inserted by firms who want him. The Reporter thus acts as a medium in which both parties are brought together.

A 3½ by 1 inch space will tell your wants so that "he who runs may read."

AMERICAN DYESTUFF REPORTER
90 William Street : : : New York

Carbic Color & Chemical Company, Inc.

INDIGOSOL O **INDIGOSOL O4B**

Aniline Colors—Chemicals

451-453 WASHINGTON STREET NEW YORK CITY

Branch Offices: Philadelphia, Providence, Boston

SOLE AGENTS FOR DURAND & HUGUENIN S.A., BASLE, SWITZERLAND

Established 1815

ARNOLD, HOFFMAN & CO., Inc.

PROVIDENCE, R. I. NEW YORK, N. Y. BOSTON, MASS.
PHILADELPHIA, PA. CHARLOTTE, N. C.

Importers and Manufacturers of

SIZING, SOFTENING and FINISHING SPECIALTIES
FOR ALL
TEXTILE FABRICS

Sole Agents for

BELLE ALKALI COMPANY, of BELLE, W. VA.

Manufacturers of LIQUID CHLORINE and CAUSTIC SODA (Solid and Flaked)
BLEACHING POWDER

UNITED CHEMICAL PRODUCTS CORPORATION

IMPORTERS, EXPORTERS AND MANUFACTURERS
YORK AND COLGATE STS., JERSEY CITY, N. J.

Manufacturers of

UCPC

DIRECT FAST BLACK L
DIRECT FAST BLUE 4 G L

Also Announcing Our New Product

DIRECT FAST BLUE 2 G L

CHARLOTTE, N. C. ———BRANCHES——— PAWTUCKET, R. I.

Index to Advertisers Appearing in This Issue

Althouse Chemical Co.	IX
American Aniline Products, Inc.	III
American British Chemical Supplies, Inc.	IX
American Dyewood Co.	—
American Laundry Machinery Co.	—
Arabol Manufacturing Co.	XVI
Arkansas Co.	X
Arnold, Hoffman & Co.	XV
Atlas Electric Devices Co.	VI
Bosson & Lane	VIII
Borne, Scrymser Co.	X
Calco Chemical Co.	—
Campbell, John, & Co.	VII
Carbic Color & Chemical Co.	XV
Ciba Co.	—
Corn Products Refining Co.	X
David, S. R., & Co.	—
Dunker & Perkins Co.	VIII
Du Pont de Nemours, E. I., & Co.	Third Cover
Dye Products & Chemical Co.	—
Dyer & Calico Printer	—
Fleischmann Co	—
Fletcher Works	—
Fortner, L. B., & Co.	—
Foster, Edward C.	XIV
French Lick Springs Hotel	XIV
Geigy Co., Inc.	Front Cover
Grasselli Dyestuff Corp.	VIII
Hussong Dyeing Machine Co.	—
Innis, Speiden & Co.	VI
International Nickel Co.	—
International Salt Co.	—
Jennings & Co.	—
Kali Manufacturing Co.	IV
Klauder-Weldon Dyeing Machine Co.	VI
Klipstein, A., & Co.	Second Cover
Lewis, John D.	—
Malt-Diastase Co.	VIII
Metz, H. A., & Co.	V
National Aniline & Chemical Co.	XII
Newport Chemical Works	Back Cover
Noil Chemical & Color Works, Inc.	—
Onyx Oil & Chemical Co.	IV
Permutit Co.	XIII
Roessler & Hasslacher	XI
Rohm & Haas Co.	VII
Sandoz Chemical Works	—
Society of Dyers and Colourists	—
Solvay Process Co.	—
Textile Finishing Machinery Co.	—
Tinc Tura Laboratories, Inc.	IV
Tolhurst Machine Works	VI
United Aniline Co.	XVI
United Chemical Products, Inc.	XV
U. S. Color & Chemical Co.	XIV
Vellner, Eugene	XI
Wolf, Jacques, & Co.	—

QUALITY STANDARDS EXL DYES DYES

MODE SHADES FOR MAKERS OF MEN'S WEAR FABRICS

EXL dyes meet the exacting requirements of textile manufacturers who have gained prestige for their adherence to quality standards.

We invite inquiries for samples and prices of these popular shades:

EXLACHROME GRAY B
EXLACHROME BRILLIANT BLUE SKB
EXLACHROME BRILLIANT BLUE CBL
EXLACHROME FAST RED B
EXLACHROME FAST YELLOW 5G

UNITED ANILINE COMPANY
Dyestuffs and Chemicals
120 High Street Boston

"EXL DYES EXL"

AMID DURON

Duron Emulsions
are stable and excel any lubricant for spinning of yarns. They increase production and guarantee a perfect carding, combing and spinning.

Art Silk Emulsions C or N Conc.
for winding artificial silk.

Amid Waxes
are far more effective in thread finishing than waxes emulsified by aid of an alkali or soap.

Amid Tallow
combines readily with all starches and far more evenly than Raw Tallow. It is neutral and non-odorous. Its ideal penetrating powers acknowledged.

Amid Fat Liquor
Amid Codolene
Solamid
admirably adapted for tanning, dressing and finishing of all kinds of leather.

Correspondence and Trial Orders Solicited

AMID DURON COMPANY
110 East 42nd Street NEW YORK

DU PONT DYESTUFFS

GALLOPONT COLORS

(Patent Applied For)

THIS series of dyestuffs, prepared for the textile printing industry, offers most brilliant shades in a wide and complete range of colors.

Combining simplicity of application and uniformity of results, they should commend themselves quickly to the consumer seeking these essential features.

The Gallopont Colors offer the following outstanding advantages:

1. Ease of application.
2. No mordants required.
3. Steaming unnecessary.
4. Whites are left exceptionally clean.

In light shades particularly, the Gallopont Colors are characterized by uniformity and extreme brilliancy.

Literature, samples and technical assistance are offered to the textile printing industry.

E. I. DU PONT DE NEMOURS & CO., INC.

Dyestuffs Department

WILMINGTON DELAWARE

THE NEWPORT COLORS

for satisfaction

When you buy a

NEWPORT COLOR

you buy more than a package of dyestuff.

With it comes the assurance of satisfaction and the co-operation of an organization with ability and willingness to make its use successful.

Newport Chemical Works, Inc.

Passaic, New Jersey

BRANCH OFFICES AND WAREHOUSES:
Boston, Mass.; Providence, R. I.; Philadelphia, Pa.; Chicago, Ill.; Greensboro, N. C.